The British Museum

The Snettisham Hoards

Volume II

Edited by Julia Farley and Jody Joy

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With contributions from Ian Stead and Sophia Adams, Janet Ambers, Caroline Cartwright, Mike Cowell, Paul Craddock, John Davies, Michael de Bootman, Philip de Jersey, John Fenn, Eleanor Ghey, Marilyn Hockey, David Holman, Duncan Hook, Susan La Niece, Janet Lang, Alice Lyons, Peter Makey, Nigel Meeks, Aude Mongiatti, Peter Northover, Daniel O'Flynn, Sarah Percival, Alan Pipe, Matthew Ponting, Fleur Shearman and Tony Spence

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Front cover: Torc L.19a–f, from Hoard L. The torc terminals are decorated with Celtic art, and it has been heavily repaired
Pg. iv: close up view of the decorated torus terminal of torc L.21a
Pg. vi: close up view of the decorated buffer terminal of torc L.13

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Part III: Discussion

Julia Farley and Jody Joy

Volume 1 of this book presented Parts I and II (Chs 1–15). Part I gave an overview of the site, the history of discoveries and the 1990–2 British Museum excavations, while Part II focused on the Later Iron Age and Early Roman hoards, including their archaeological context and detailed catalogues of both metalwork and coins. This volume, Volume 2 (Part III, Chs 16–24), moves from the detailed excavation reports and catalogues to consider the conservation and scientific analysis of the hoard objects, as well as exploring the wider significance of the site and finds.

Chapter 16 presents the ground-breaking conservation campaign, which has allowed the reconstruction and interpretation of several key objects, including the helmet which contained Hoard F, and several crushed tubular torcs. A comprehensive programme of scientific analysis was carried out to investigate the materials and techniques used to manufacture the torcs, and this is presented in Chapter 17, accompanied in Chapter 18 by a discussion of the compositional analyses of the bronze objects. Environmental evidence from charred wood preserved at the site is assessed in Chapter 19. Chapter 20 explores torc biographies and lifecycles through evidence for use, wear and repair of the Snettisham torcs, some of which are likely to have been more than a century old at the time they were buried, and many of which show evidence for repair or deliberate fragmentation and recombination. These analytical chapters are supported by appendices found at the end of Part III: Appendix 3 comprises a concordance with previously published finds listings, catalogues and numbering systems; and Appendices 4 and 5 give the results of compositional analyses of Iron Age gold alloy coins and selected gold and silver alloy objects from the NCM collections and comparative material.

Discussion chapters 21 to 24 investigate the wider significance of Snettisham in discussions of Celtic art, the social role of hoards and life in Iron Age Britain more generally. The finds from Snettisham represent one of the greatest concentrations of decorated Iron Age metalwork anywhere in Europe. The importance of this decoration is considered in Chapter 21, which presents not just detailed stylistic arguments, but also a consideration of what this art did, and how it transformed both object and wearer. Chapter 22 considers the relationships between people, objects and materials in Iron Age Norfolk. This includes a corpus of other known torcs from Iron Age Britain (an updated and expanded version of a gazetteer originally compiled by Ian Stead). Chapter 23 and the final conclusion, Chapter 24, move beyond material culture to explore the place of Snettisham in its wider social and landscape context. Discussion focuses on the site, its changing significance over time and the potential importance of its location. The editors argue that repeatedly depositing artefacts at Snettisham, with subtle differences in the composition and make-up of each of the hoards, was part of creating, negotiating and reinforcing social structures, as well as performing and creating social change. Specifically, we suggest that hundreds of torcs were deliberately taken out of social circulation around 60 BC as part of a shift from a 'world of torcs' to a 'world of coins' (Gosden 2013).

Figure 16.1 Simon Dove (right) and Peter Makey (left) lifting torcs from Hoard G, during the 1990s excavations at Snettisham (Ken Hill)

Chapter 16
Conservation of the Snettisham Torcs

Fleur Shearman and Marilyn Hockey

This chapter describes the role played by the discipline of archaeological conservation applied to the conservation and research of objects recovered from Snettisham. This work was largely carried out by metals conservators at the BM and has run in parallel with scientific investigation and archaeological research since the first discoveries at Ken Hill in the late 1940s. This chapter deals primarily with the torcs. For the reconstruction and investigation of the Hoard F helmet, see Chapter 14, entry for F.445 (pp. 266–274).

Since 1922 the BM had profited in having a designated Research Laboratory which housed the Science Department of analytical scientists working on fundamental questions of a material or technical nature. This allowed an integrated team of archaeologists, scientists, conservators and replica makers to work in close proximity. Conservation of the Snettisham artefacts benefitted by working with specialist mount-makers and designers both within and outside the Museum, leading to enhanced opportunities for public display and loan of the metalwork, enabling a wider sharing of the material outside London and Norwich.

Interventions 1949–1990

The hollow, tubular torcs which comprised Hoard A had most likely already suffered plough damage by the time of their discovery. Fragmentation and deformation can be seen in a black and white photograph taken before restoration (Clarke 1951c). Intentional dismantling before original deposition is a relevant factor for metalwork across the hoards (Ch. 20), but for the highly restored Hoard A, this cannot now be clearly and sequentially quantified. The extent of burial damage and resulting fragility of the torcs evidently led to the decision, in the years following their recovery, to carry out interventions in order to both strengthen and restore them to something approaching an authentic, original state.

It is recorded in the monthly reports of the Research Laboratory that they first assayed the Snettisham metalwork for bullion value in February 1949. The torcs from Snettisham were also investigated by scientists and material specialists in that year (Research Laboratory archive correspondence files, BM, Department of Scientific Research). It has not been possible to locate surviving documentation of the detail of early treatment interventions in the post-war period. In Rainbird Clarke's (1954) account of his excavations and discoveries at Snettisham, the sheet-metal torcs are illustrated in a restored state, reconstructed into complete torcs with location and reintegration of formerly detached elements. It is likely that then, as now, this was carried out by careful manual manipulation or controlled use of soft tools such as a horn hammer to remove dents. The reattachment and reinforcing of loose and damaged fragments and stabilisation of running or mobile cracks would be carried out to prevent further damage occurring (Plenderleith and Wernher 1971 [1956]; Hockey 2001). It is probable that this work was led or executed personally by Herbert Maryon (a specialist in metalwork and enamelling who worked as a technical attaché of the Research Laboratory at the BM between 1945 and 1963), in association with Moss and Plenderleith, also of the Research Laboratory (Plenderleith and Wernher 1971 [1956]; Maryon

2011 [1912]). A close collaboration was also maintained by Rainbird Clarke with colleagues in the Prehistory and Europe subsection of the Department of British and Medieval Antiquities at the Museum.

The Research Laboratory facility was also responsible for creating early replicas of museum artefacts in a variety of different materials. The Snettisham torcs benefitted from pioneering replica-making facilities in the form of electroforming tanks which had been installed in 1949 in the Research Laboratory and which enabled electroform replicas to be made. The replica of the Snettisham Great Torc was among the first such copies made by a combination of moulding, electroforming and fabrication likely carried out by specialists such as Baron Nimmo and his colleague Arthur Prescott. For metals, this procedure began with the creation of moulds using silicone rubber. This came under the care of skilled technicians as it involved a direct moulding from often fragile objects to create a master mould from which to make the electroform. The silicone moulds were then immersed in electrodeposition plating tanks. The copy made in copper by electrodeposition could then be gilded or silvered using cyanide salts, again by tank immersion. The complete replica of the Great Torc included neck wires made by Herbert Maryon.

Much of the applied conservation research for Snettisham would have been carried out in the Research Laboratory premises, as it had its own integrated conservation area with designated metals specialist technicians and, from the mid-1970s, conservators, a number of whom were trained as silversmiths. This practical underpinning knowledge proved particularly useful in solving questions of the technical manufacture and decoration of metals in dialogue with the materials scientists. Experimental wires, neck-rings and a range of terminal types were made to investigate the manufacture of these features of the torcs (see also Ch. 17).

The replica of the Great Torc was displayed in a 1972 exhibition commemorating the fiftieth anniversary of the Research Laboratory, held in the upper floor public galleries of the Department of Prehistoric and Romano-British Antiquities. This replica is still in use as a teaching aid for public outreach activities for families and academic research by archaeologists and metallurgists (see **Fig. 17.58**).

Conservation of material recovered during the 1990s excavations at Snettisham

On-site conservation

A site conservator, Simon Dove, was included in the team that excavated at Snettisham. After training at the Institute of Archaeology, Simon had been based in the Department of Prehistoric and Romano-British Antiquities. He played a full part in the archaeological excavations, as well as giving guidance on the lifting of vulnerable finds.

The role of a site conservator is to ensure safe retrieval of objects, to minimise loss of information and physical damage or disturbance and to ensure they are packed securely for transit. The conservator is also responsible for the continuity of archaeological recording of a contextual nature. At Snettisham, recovery of the stratified deposits of multiple, sometimes fragmentary, torcs from stacked pits was progressed after recording and planning relative positions within the layered deposits (Ch. 12). Each stage was documented by the site photographer.

In the case of the more fragmentary torcs, lifting would have been carried out by the site conservator. Limited use of consolidants and reinforcing materials is routine in these circumstances, in order to mitigate further damage and enable safe lifting to take place. In this case their use would have been carefully managed to avoid contamination of associated organic materials. Block lifting of associated groups of fragile objects was not pursued as an option at Snettisham for logistical reasons, as the deep pits would have been damaged by the soil disturbance necessary for extraction (**Fig. 16.1**).

Transfer to the BM and initial processing and recording

The recovered finds from the 1990–2 excavations were sent to the BM Department of Conservation. Dove received and assessed the recently excavated metalwork, leading a parallel and co-ordinated conservation campaign, providing an essential and meticulous link of continuity between the excavations, the old conservation laboratory based in the Department of Prehistoric and Romano-British Antiquities, and the Department of Conservation, which had been established in 1975. The team which processed over 300 torcs retrieved from the 1990s campaign included most of the metals specialists who worked in the conservation department. This included valuable work by conservation students from universities overseas, including the Sorbonne, as well as MA/MSc students from the Institute of Archaeology in London, who were on placement in the Metals Section at the time.

As team leader, Dove oversaw the multiple variations in treatment regimens required for the range of metals and states of preservation present across the different groups and hoards. He also supervised the methodical recording of treatments and the later transfer of these written records to computer archives in the later 1990s. Treatment records included technical observations made by conservators, which assisted with archaeological interpretation of the hoards.

The Snettisham torcs were subject to a number of conservation processes at the BM. The rest of this chapter explores four of these: corrosion removal; the recording and recovery of organic evidence and traces of gilding; reconstruction of fragmentary objects (primarily those subject to accidental breakage during burial or recovery); and investigative reshaping of decorated crushed gold objects.

Corrosion removal

Where the metal of the gold and silver torcs was alloyed with substantial amounts of copper, or where copper alloy objects were co-located with them in burial, the precious metal was often covered with the corrosion products of the baser copper metal. In terms of electro-chemical potential the baser copper metal will corrode in preference to the nobler metal. This was particularly true of Hoard F, where a copper alloy helmet (see Chs 12 and 14, F.445) had been used to contain gold, silver and copper alloy torc fragments. Both

Figure 16.2 Helmet and torc fragments from Hoard F, photographed on site by Charles Hodder, showing green deposits of copper corrosion on surfaces

copper alloy and precious metal objects were comprehensively covered in green copper corrosion products at the time of recovery (**Fig. 16.2**).

Conservators bring their training and experience into play in deciding on appropriate choice of treatments and approaches to the retrieval of information. These decisions are acted upon after discussion with curators and scientists about the goals and direction of research. Corrosion removal is a relatively common procedure, but rigorous preliminary microscopic examination of surface and substrate is required to select the appropriate procedure, particularly if underlying polychromy or gilding is suspected (see Ch. 17).

It is a legitimate course of action to recover the original surface of corroded objects by the judicious use of dilute chemicals, where the substrate is suitable and providing their use is carefully managed and any residues neutralised or washed off (Cronyn 1990). The mild chemical reagents soften and loosen the copper corrosion products which can then be removed with wooden or metal tools. This process is carried out while working with a binocular microscope to avoid marking the surface, so that any original tool or wear marks can be assessed. It is also essential to restrict the use of chemicals to local and dilute applications, as early on in the conservation of the Snettisham torcs it was understood that there was a great variety of metal surface compositions, some of which were clearly the result of intentional treatments (see Ch. 17). As surface colour was clearly being manipulated for deliberate effect, it was essential that this evidence was not compromised by abrasive cleaning or polishing of the metal, which could have destroyed or damaged surviving evidence. Additionally, making joins to complete broken torcs would have hidden the metallurgy of the cross-section, where in many cases wires could clearly be seen to have enriched levels of silver and gold at their surfaces. Where technology studies took precedence over display criteria, such re-joining work was not progressed.

Gilding and organic evidence recovered during conservation

Corrosion products on the surface of objects was also found in some cases to be masking traces of gold leaf and mercury-amalgam gilding, used to embellish the silver and copper alloy torcs. This was uncovered during microscopic examination. In these instances, in order to avoid the risk of dislodging the gilding, corrosion could only be removed locally and incrementally under a binocular microscope, using small hand-tools such as small medical scalpels. Following examination and cleaning to reveal the decorative surfaces, many gilded fragments from broken copper alloy torcs were sorted and categorised by Institute of Archaeology MSc student He Huang, who then worked under BM metals scientist Dr Quanyu Wang in the X-ray fluorescence analysis (XRF) of the pre-sorted metalwork. (For results of analyses and technical discussion of gilding, see Ch. 17.)

Mineral-preserved organic remains are commonly found in association with archaeological metalwork where their

Figure 16.3 Detail of copper alloy torc L.6 *in situ* with original organic binding repair

exact form may be permanently captured or 'fossilised' in preserved or replaced form. Burning of wood to produce charcoal can also transform it to a stable form amenable to species identification. While undergoing microscopic investigation during the initial conservation process prior to corrosion removal and stabilisation, five torcs with charred organic remains in their terminals were revealed and conserved. Additionally, any other organic materials used, such as original repairs or attachments, were noted. Observations were logged by annotated drawings on conservation technical information records and drawn to the attention of materials scientists reviewing technological aspects of torc manufacture (see **Figs 17.55, 17.56, 19.1**). In order that these remains were amenable to taxonomic studies by scientists, consolidation with synthetic materials was kept to a minimum. (See Ch. 19 for identification and interpretation of organic materials found in association with the torcs.)

Fragmentation and reconstruction

The Snettisham hoards include a proportion of both fragmentary metal and melted pieces, for example those found in Hoard F. In these cases, it was important to distinguish between deliberate damage, resulting from human agency before burial, and post-deposition damage due to deteriorating physical condition. A timeline may be evident where deliberate pre-deposition damage and post-deposition damage occurs within the same objects, such as instances where inter-crystalline corrosion, developing through centuries of burial, causes tears and cracks exhibiting diagnostic granular edges, which run through ancient repairs or deliberate deformation.

Both copper alloy and silver alloy torcs had fragmented due to corrosion and a weakened structure, evidenced by a typical jagged break edge profile. Where it could be established that torcs had been subject to fragmentation as a consequence of corrosion and/or soil pressure during burial, they were, as far as possible, reconstructed using reversible adhesives. Where remedial work was helpful for illustrating original form and structure they were physically reconstructed and support mounts prepared.

There are two main goals in reassembly of fragmented objects: legibility and stability. While it is usual to attempt to return legibility to the original object and enable it to be studied and even appreciated as part of a museum display, more critically a corroded fragmentary object is always vulnerable to further damage. Natural corrosion processes during burial produce a weakened and transformed structure, prone to further disintegration and at risk from handling.

An example among the Snettisham torcs was L.6, a multi-strand copper alloy torc which had been broken and repaired by the time it was deposited. The plant fibre binding, wound round the damaged area of the torc in antiquity, can be clearly seen in a site photograph of the excavation of this hoard (**Fig. 16.3**; see Ch. 19 for identification and analysis).

The broken torc wires were still mobile, rendering the fragile organic binding extremely vulnerable. Neither the torc nor its repair had the physical strength to be self-supporting. After careful recovery by the site conservator and transfer to the conservation laboratory, the solution was to insert strands of fibreglass tissue, pre-soaked in adhesive, into the hollow core between the wires to give back its structural integrity and to immobilise both inorganic and organic elements (**Fig. 16.4a–b**).

The fibre binding was lightly consolidated to strengthen its weakened structure and an unconsolidated sample kept for identification purposes. The torc in a conserved condition could now be displayed as part of its contextual group, Hoard L. The display support mount lifted the binding clear of direct contact with any surface.

In addition to unintentional breakage, deliberate cutting up could also be recognised among the finds from Snettisham. A good example is a solid, plain, copper alloy torc K.1, which had intentionally been cut up into short sections (for more on the practice of cutting up, see Ch. 20). It would be inappropriate to reconstruct this torc even though it would have been quite feasible to reassemble it. The solution was to lay out the pieces in their relative position in a pre-cut mount so the torc could be physically supported but could be easily read as a complete object, making categorisation and cataloguing easier.

Investigative reshaping

Hoard F contained two crushed gold alloy tubular torc fragments, each consisting of a terminal and a short part of the hollow neck-ring (F.31a and F.43). Both were reshaped by metals conservator Marilyn Hockey in 2007 at the request of Ian Stead and Jody Joy. The torcs were first assessed for suitability in terms of their physical properties and the validity of the rationale for changing appearance by this route of intervention. Ethical investigative reshaping carried out at the BM had been described some years previously at an international metals conference (Hockey 2001) and had been explored in an earlier publication (Oddy 1992; see also Hockey 1989; 1993; 1999; 2001).

Figure 16.4a–b Detail of L.6 after remedial conservation

An essential corollary to the feasibility of the shaping process is the ethics of reshaping ancient metal. If it can be proven that the object was deliberately deformed or broken in antiquity it would be unlikely that it would be 'taken back' to an earlier albeit undamaged condition unless, as is the case with torcs F.31a and F.43, such work is considered essential to progress interpretation and scholarship (Oddy 1992; Hockey 2001). After detailed discussion with curators it was decided that as so few items from the hoards were decorated, and given that the decoration on these pieces was so unusual, the research potential of this reshaping work outweighed other ethical considerations, so long as the work was fully documented.

Alloy content is a critical point as reshaping of crushed gold metal may not be practically possible where silver or copper is also present as they can harden and embrittle the nobler metal, particularly where inter-crystalline corrosion has occurred. This is equally true of silver alloys with a high

Figure 16.5 Hollow gold torc F.43, before investigative reshaping

Figure 16.6 Hollow gold torc F.43, after investigative reshaping

copper content where the precious metal has been extended by alloying with a baser copper content. In the instance of the crushed gold torcs from Hoard F, a detailed condition assessment was undertaken by both the conservator and metallurgist Duncan Hook before any physical manipulation was progressed. This included metallurgical work to confirm the purity of the gold and therefore its amenability to reshaping.

The advantages of investigative and remedial reshaping fundamentally include bringing structural integrity and strength by restoring the original form and shape of the object (Hockey 2001). This is achieved by manual manipulation, bringing together breaks and unfolding creases by hand, while backing or bridging weak areas with the use of adhesives and lightweight backing materials such as nylon gossamer tissue. No hot working is used in this process. The use of heat in the reshaping or repair of archaeological gold is not necessary in circumstances such as those described here and carries risks which almost invariably contraindicate its use.

Torc F.43 was fully reshaped manually as described above. The fragment had self-evidently been deliberately flattened and pierced for suspension in antiquity. Molten pieces of other gold objects had then attached themselves to areas of the already flattened surface (**Fig. 16.5**). The rationale for reversing this ancient flattening was as mentioned above, to reveal the hidden decoration, which was the subject of speculation. Only after unfolding could the full design be seen for the first time (**Fig. 16.6**).

F.31a was investigated experimentally and partly opened out using the same methods as in F.43, to reveal the decoration and its original form. A new discovery was a hidden piece of another torc (F.31b) which was released from its trapped position inside the terminal.

Since the date of this work, non-invasive methods of imaging such as Computed Tomography (CT) scanning have been developed, which in some cases can be used to interrogate the hidden interiors as well as surfaces of objects (Fletcher 2017). These techniques remain challenging to use on gold alloys, due to X-ray absorption and scatter from the metal (see Ch. 17), but it is possible that such non-invasive imaging options might be possible on similar objects in the future. Reflectance Transformation Imaging (RTI) is also now routinely carried out in the Museum and elsewhere in the cultural heritage field to interrogate and resolve surfaces of objects.

Conclusions

The conservation of the Snettisham torcs at the BM involved an integrated team of archaeologists, curators, specialist material scientists, metals conservators and replica makers. This interdisciplinary team enabled the entire assemblage to be researched in depth over decades. The precious metal torcs from Snettisham, which are of the best of their group, occupied the majority of the efforts. On completion of the gold and silver torcs, the team could also turn to the fragmentary copper alloy and sheet-metal objects.

The approach was carefully tailored for each object, based on an assessment of structural integrity and degree of corrosion, biography (whether any damage was intentional or accidental), whether traces of organics or technological processes such as gilding survived, and the potential costs and benefits of more interventive processes such as reshaping. This fundamental work has enabled the hundreds of complete and fragmentary torcs from Snettisham to be catalogued, researched and, in many cases, displayed to the public.

Chapter 17
Technology and Manufacture of the Snettisham Torcs

Nigel Meeks, Aude Mongiatti, Daniel O'Flynn and John Fenn, with contributions by Janet Ambers, Caroline Cartwright, Duncan Hook and Susan La Niece

17.1 Introduction

This chapter deals with the technology and manufacture of the torcs from Snettisham. The number and variety of torcs from the site provide a unique opportunity to study Iron Age metalsmithing traditions. The technological history of an object is locked into the microstructure and composition of the metal and the tool marks from the goldsmith's handiwork are preserved in the surface. Varied colours, from golden through to silver, reflect the compositional range of the alloys used, and processes of surface enrichment and even gilding.

Building on a preliminary publication by Meeks *et al.* (2014), this chapter presents the first fully detailed publication of the comprehensive technological examination of the Snettisham metalwork. Further technical and scientific analyses that informed detailed descriptions of individual objects are presented in the catalogue, Chapter 14.

This chapter is divided into six main parts. The first, section 17.2, introduces the analytical techniques used, the range of objects sampled and the sampling methodology. Over a hundred objects were analysed, selected to be representative of wider patterns among the hoard material.

The main materials used in the construction of many of the torcs are gold sheet and wires and the composition and manufacture of these materials are investigated in detail in sections 17.3 and 17.4.

In terms of composition, the analysis showed four different alloy groups:

- High gold-silver with low copper alloys (used in both wires and sheet objects)
- Silver-gold-copper alloys (wires)
- High-copper and low-gold silver alloys (wires)
- Bronzes (wires)

The nature of these alloys reveals the skill and adaptability of Iron Age metalsmiths. The high-gold alloys used for sheet metal were carefully selected for maximum malleability and ductility, whilst the wide range of alloys used in wire manufacture seems to have been designed to take advantage of the compositions with the lowest possible melting temperatures.

Colour was clearly an important element in alloy selection too, and both wire and sheet components show distinct evidence for specific treatments such as surface enrichment of gold/silver content. Extensive experimental work on wire production, in partnership with accomplished metalsmith John Fenn (detailed on p. 433), has revolutionised our understanding of how this versatile material was manufactured in late Iron Age Britain. Fenn was able to produce extremely close replicas of the wires seen at Snettisham, demonstrating that they were produced by forging out square-section wire from an ingot or rod. Repeated cycles of hammering, annealing and pickling to create the wires resulted in the selective removal of much of the copper from the surface, while the gold and silver from the original copper-rich core phase both stayed in the surface layer, consequently enriching it in precious metals.

This transforms the surface colour, which becomes notably silvery/pale gold compared to the coppery-coloured core. Some of the gold sheet samples tested, and wires with a

very thick enriched surface, in particular those with depleted silver as well as copper, may also have been treated by a chemical process akin to the 'parting process' used in gold refining.

These aspects of alloy composition, colour and surface treatment are discussed in section 17.5. Perhaps the most dramatic discovery is the use, on some bronze torc wires, of mercury gilding. This is the earliest documented use of this technique in Britain and speaks to the wide networks of trade and technological exchange in which goldsmiths and their communities must have been involved. The techniques observed at Snettisham suggest a preference for torcs in colours ranging from white, through pale or silvery greenish-gold, to yellow-gold. More reddish/copper-coloured alloys appear to have been avoided, though of course bronze objects appear in most of the hoards. The deployment of gilding, however, does suggest that yellow gold must have been a highly valued colour.

The final main section, 17.6, is a comprehensive study of the construction of multi-component torcs with details of the manufacture of large wire neck-rings and a focus on cast-on terminals and other forms of terminal construction. The range of objects at the site is extraordinary, with remarkable variation across certain standard elements of torc construction. Tubular torcs and a small number of unusual terminals were constructed from gold sheet. These complicated composite objects were soldered or mechanically attached together, some including decorative elements such as beaded wire and filigree, with tooled decoration including both simple punch-marks and high-relief repoussé designs embellished with punching and chasing. Multi-strand torcs also show great diversity, from the simplest two-wire neck-rings to complicated designs which combine wires in multiple stages to produce effects resembling cables or braids. The preservation of organic remains in some small bronze torcs demonstrates how wires were sometimes coiled around a wooden core to create a rope-like effect. Terminals are just as diverse, ranging from simple loops made from the ends of the neck-ring wires, to solid cast-on buffer and torus terminals, right through to complex composite terminals with both cast and sheet elements. The range of techniques and designs employed suggests a rich and varied metalworking tradition, revealing the incredible skill and depth of knowledge of the metalworkers who created these spectacular objects.

Finally, a short discussion and summary of the findings is presented in section 17.7.

A note on alloys

The terminology used around alloys in this chapter is different from the more general terms applied in the catalogue. There are well over a thousand metal objects and fragments from Snettisham, and the vast majority have not been subject to scientific analysis to determine their precise composition. For this reason, the catalogue uses only general terms based, in most cases, on visual examination of the objects. The term 'gold/silver alloy' is used for torcs where visual analysis suggests a significant precious metal content. The analytical work outlined in this chapter and in Chapter 18 (on samples prepared specifically for microscopy and analysis of uncorroded core metal) shows that most of these are ternary alloys of gold, silver and copper, and that this broad group includes some alloys in which copper is the dominant component. Thus, 'gold/silver alloy' as used in the catalogue, includes: high gold-silver/ low copper alloys, silver-gold-copper alloys, and high-copper/ low-gold silver alloys. For those objects where only a visual examination of their surface has been carried out, it is not possible to categorise them into these alloy groups because the surface colour is not necessarily indicative of the core alloy composition due to surface enrichment effects (detailed in sections below).

In the catalogue, the broad term 'copper alloy' is used for those objects and numerous fragments that clearly exhibit a greenish surface corrosion patina, common to such buried objects. Scientific analysis of a limited number of these (82 analysed in Ch. 18; Appendix 5) show they are all of bronze (i.e. the common and widespread alloy of copper and tin), which strongly suggests that the vast majority, if not all, of the 'copper alloy' objects in the Snettisham Hoards are bronzes. Analysis has also revealed that some of these bronze objects were originally gilded.

The binary distinction in the catalogue between copper alloy and precious metal objects is simplistic compared to the nuanced scientific analysis presented here. However, it does reflect what appears to be a genuine ancient distinction between bronzes and objects containing significant amounts of gold and silver (see Ch. 18).

17.2 Methods and sampling strategy

In order to investigate the goldsmithing manufacturing and decorative techniques used to create the Snettisham artefacts, a number of complete torcs were first studied non-invasively using radiography and microscopy, the majority of these from Hoard L (see **Table 17.1**). Most were also analysed non-destructively using X-ray fluorescence (XRF) on their surface to identify their alloy compositions. The initial results obtained from these non-invasive analyses were useful although limited: a wide range of alloys was identified, but due to potential surface effects, such as deliberate treatment and corrosion, surface analysis may not fully reflect the core metal. Similarly, the construction of torcs could be identified directly from artefacts but the making of individual components, such as sheets and wires, needed further investigation. The broken fragments of torcs, sheets and wires from Hoard F provided the perfect opportunity for selection, sampling and preparing small cut pieces for full compositional analysis and metallurgical examination, which would identify core alloy compositions, surface enrichment and details of sheet and wire making. The preliminary non-invasive binocular optical microscopy (OM) study provided an informed sampling strategy in terms of the range of components' colours, sizes and shapes and corresponding types of alloys.

From the wide range of torcs, wire components and fragments in the collection, representative examples of most types were examined for evidence of construction, and appropriate samples taken of these types from the fragmentary Hoard F for microscopy and analysis (**Table 17.1** gives a full listing of all objects analysed or sampled as

Catalogue number (this volume)	Registration number (BM unless otherwise noted; NCM = Norwich Castle Museum)	X-radiogr-aphy	SEM imaging	Optical microsc-opy	Polished cross-section specimen number	SEM imaging of polished sample	SEM-EDX analysis	Optical microsc-opy of etched bronze sample
	Snettisham finds							
A.1	1949.74.2 (NCM)	x		x				
A.2	1949.74.1 (NCM)			x				
A.3	1949.74.3 (NCM)			x				
A.4	1949.74.6 (NCM)	x						
A.5	1949.74.4 (NCM)			x				
A.6	1949.74.5 (NCM)			x				
A.7	1949.74. (NCM)			x				
E.1a (Great Torc)	1951,0402.2	x	x	x				
F.5c	1991,0501.55			x				
F.5d	1991,0501.56			x	J1513	x	x	
F.5e	1991,0501.57			x	J1515	x	x	
F.5f	1991,0501.58			x	J1514	x	x	
F.9a	1991,0501.125		x	x	J1494	x	x	
F.9c	1991,0501.127		x	x	J1495	x	x	
F.9d	1991,0501.128		x	x	J1496	x	x	
F.11a	1991,0501.133		x	x	J1497	x	x	
F.14b	1991,0702.9		x	x	J1532	x	x	
F.15a	1991,0702.137		x	x				
F.17a	1991,0501.216		x	x	J1533	x	x	
F.17b	1991,0702.8		x		J1534	x	x	
F.19b	1991,0501.161		x	x	J1493	x	x	
F.21b	1991,0501.207		x	x	J1531	x	x	
F.22a	1991,0501.148		x	x	J1488	x	x	
F.34	1991,0501.16		x	x	J1503	x	x	
F.35	1991,0501.21			x				
F.37	1991,0501.24		x (of wire)	x	J1505	x	x	
F.40	1991,0501.52			x				
F.48	1991,0501.27		x	x	J1506	x	x	
F.49	1991,0501.138		x	x	J1501	x	x	
F.51	1991,0501.34		x	x	J1521	x	x	
F.52	1991,0501.76		x	x	J1509	x	x	
F.53	1991,0501.118				J1523	x	x	
F.55	1991,0501.32		x	x	J1507	x	x	
F.62	1991,0501.30		x	x	J1522	x	x	
F.65	1991,0501.36		x	x	J1508	x	x	
F.72	1991,0501.45		x	x				
F.84	1991,0501.158		x	x	J1492	x	x	
F.85	1991,0501.95		x	x	J1525	x	x	
F.88	1991,0501.22		x	x	J1504	x	x	
F.89	1991,0501.101		x	x	J1524	x	x	
F.93	1991,0501.83		x	x	J1510	x	x	
F.94	1991,0501.17		x	x	J1502	x	x	
F.97	1991,0501.85		x	x	J1511	x	x	

Table 17.1 Objects analysed as part of this study, and methods used

Catalogue number (this volume)	Registration number (BM unless otherwise noted; NCM = Norwich Castle Museum)	X-radiography	SEM imaging	Optical microscopy	Polished cross-section specimen number	SEM imaging of polished sample	SEM-EDX analysis	Optical microscopy of etched bronze sample
F.99	1991,0501.137		x	x	J1498	x	x	
F.102	1991,0501.187		x	x	J1538	x	x	
F.103	1991,0501.215		x	x	J1530	x	x	
F.106	1991,0501.19			x				
F.108	1991,0501.154		x	x	J1490	x	x	
F.116	1991,0501.145		x	x	J1500	x	x	
F.119–20	1991,0501,80–81		x	x	J1460	x	x	
F.122	1991,0501.153		x		J1491	x	x	
F.135	1991,0501.222		x	x	J1526	x	x	
F.146	1991,0501.214		x	x	J1529	x	x	
F.147	1991,0501.221		x	x	J1527	x	x	
F.148	1991,0501.86		x	x	J1512	x	x	
F.153	1991,0407.44.a			x	J1516	x	x	
F.154	1991,0501.144		x	x	J1499	x	x	
F.156	1991,0501.87		x	x	J1520	x	x	
F.158	1991,0501.191		x	x	J1537	x	x	
F.159	1991,0501.193		x	x	J1535	x	x	
F.160	1991,0501.192		x	x	J1536	x	x	
F.167	1991,0702.122		x	x				
F.168	1991,0702.121		x	x				
F.179	1991,0702.117		x	x				
F.182	1991,0702.111		x	x				
F.250	1991,0702.181				J1462	x	x	x
F.361	1991,0702.84		x	x	J1463T (transverse section) J1464L (longitudinal section)	x	x	x
F.380	1991,0501.218				J1528	x	x	
F.429	1991,0501.156		x	x	J1489	x	x	
G6	1990,1101.12; 1990,1101.14				J1022	x	x	
L.1	1991,0407.23			x				
L.2	1991,0407.24			x				
L.3	1991,0407.25			x				
L.4	1991,0407.26			x				
L.6	1990,1101.7			x				
L.7	1991,0407.27			x				
L.13	1991,0407.31			x				
L.14	1991,0407.32			x				
L.16	1991,0407.34		x	x				
L.17	1991,0407.35			x				
L.18	1991,0407.36			x				
L.19a (Grotesque Torc)	1991,0407.37	x	x	x				
L.21a	1991,0407.39			x				

Table 17.1 continued

Catalogue number (this volume)	Registration number (BM unless otherwise noted; NCM = Norwich Castle Museum)	X-radiography	SEM imaging	Optical microscopy	Polished cross-section specimen number	SEM imaging of polished sample	SEM-EDX analysis	Optical microscopy of etched bronze sample
S.11a	1991,0407.57		x	x	J1517	x	x	
S.11b	1991,0407.47			x	J1519	x	x	
S.13	1991,0407.40		x	x				
S.16	1969.55.3 (NCM)			x				
S.17	1965.30.1 (NCM			x				
S.19	1992,1203.4			x				
S.32	1991,0407.50					x	x	
S.34	1991,0501.226		x	x				
S.35	1991,0407.51		x	x				
S.36	1991,0407.49		x	x				
S.37	1992,1203.1		x	x		x	x	
S.38	1991,0501.223		x					
S.39	1991,0501.225		x	x				
	Sedgeford Torc							
N/A	2005,1103.1	x	x	x				
N/A	1968,1004.1	x		x				
	Newark Torc							
N/A	Newark and Sherwood Museum Service	x	x	x				

Table 17.1 continued

part of this study). This allowed the technological study of goldsmithing practices and the determination of alloy compositions and surface-enrichment processes. The technological study involved visual examination and photographic recording of complete and fragmentary torcs for their physical form and metalsmithing construction techniques. This was followed by detailed examination involving macro-imaging, digital optical microscopy and scanning electron microscopy with energy dispersive X-ray microanalysis (SEM-EDX) of objects and samples taken from fragments to unravel their metallurgical technology. This comprehensive approach provided visual and analytical evidence of the sophisticated metalworking techniques used by the Iron Age craftworkers. In addition, XRF surface analysis was carried out on various torcs that were not able to be sampled. XRF was the technique used for the original analytical survey of the excavated material and discovered the use of mercury gilding on some bronze objects (see below and Ch. 18 for more on mercury gilding): an early analytical study of sampled fragments from the collection of Snettisham material at Norwich Castle Museum for a BA dissertation provided the first clues to the potential range of alloys used (Stone 1987; Ch. 18; Appendix 5). High-voltage X-radiography was used on a few selected torcs and terminals to investigate internal structures and fabrication techniques. A series of experimental reconstructions of key goldsmithing processes allowed metallurgical characterisation of the goldsmithing technologies and workshop practices, and a comprehensive understanding of the metals and methods used.

Full details of the techniques and terminologies used in optical microscopy, scanning electron microscopy with microanalysis and X-radiography are given on pp. 475–7.

Sampling of fragmentary wires, sheet and terminals from Hoard F

It has been long recognised that the main techniques for constructing torcs and terminals in Iron Age Britain were a combination of thick and thin wire manufacture, casting of some terminals, creation of a variety of sheet components, and various punching, chasing, engraving and forming operations as appropriate for the individual objects (Brailsford and Stapley 1972; Clarke 1954), the range of which illustrates the extensive skill-set of the metalsmiths. All of these processes are represented at Snettisham, and Hoard F (an assorted collection of hundreds of fragments of broken, cut and damaged objects) is broadly representative of the range of terminal and neck-ring types, alloys, colours, and construction techniques. Because many artefacts from Hoard F are fragmentary, this provided the opportunity for selective sampling in order to carry out a full metallurgical and SEM-EDX examination and microanalytical survey of the wide range of wire types and colours. In addition, many of the fragments are small enough to allow direct observation of their surfaces in the large chamber SEM to

Figure 17.1 Example of an interlinked wire assemblage from Hoard F (F.5a–g) with several different wire types of gold and silver alloys (see also Fig. 17.18a–b)

Figure 17.2 Fused mixed gold wires with solidified molten globules, Hoard F (F.40)

characterise surface textures, worked details and physical forms, corrosion and damage/cutting, and wear during use. Hoard F was therefore identified as ideal for the purpose of our scientific investigation into wide-ranging aspects of torc construction and manufacture without requiring damage to complete objects.

The fragmentary wires range between 0.6mm to just over 10mm in thickness and are of various forms: circular section with smooth surfaces, finely faceted circular section, heavily faceted 'polygonal' section, very thick multi-faceted 'circular' section, square section, twisted square section, and some heavily corroded wires whose forms cannot now be discerned. Multiple wires were often coiled or twisted/plied together to make multi-strand constructions (see the neck-ring construction typology section in Ch. 13). Additionally, there are composite groups of various mixed and seemingly unrelated torc and wire fragments interlinked together (**Fig. 17.1**), and also fused mixed wire assemblages with solidified molten globules on their surfaces (**Fig. 17.2**) (see also sections on these composite objects in Chs 20 and 23).

Binocular optical microscopy of the fragmentary mixed wire and sheet objects of Hoard F facilitated selection for sampling. In addition, digital imaging recorded the key characteristics of the sampled wire types that were representative of the whole range of gold, silver and bronze torcs and wires found within the Snettisham collection. As the colours of the wires and sheets are determined by the surface composition of the metal, it was essential to sample and mount them as polished cross-sections for microscopy and analysis, to characterise the full range of alloys used and compare the original core metal with the surface composition and microstructure and identify potential evidence of surface-enrichment processes.

In consultation with curators and following careful macroscopic and microscopic assessments of the fragments and artefacts from Hoard F, over 50 small samples *c.* 2mm long were cut through wire and sheet using a low-speed diamond saw (**Fig. 17.3a**). Samples were mounted in epoxy resin and cross-sections polished down to a final finish with 1 micron diamond paste (**Fig. 17.3b**). For SEM-EDX microscopy and analysis, the gold and silver alloy samples

Figure 17.3a–b a) Low speed diamond saw in action cutting a multi-strand thin wire sample (arrowed) from reel terminal torc F.120 (object in Fig. 17.39); b) Cut sample of tightly twisted multi-strand bronze torc/bracelet fragment F.361 (detail in Fig. 17.54a–e) mounted in transverse cross-section in the centre of a resin mount and polished ready for optical microscopy and SEM examination. The mount is 30mm in diameter

a b

a b c d e

Figure 17.4a–e a) Large gold tubular torc A.1 (approx. diameter 240mm front to back including terminals); b) Film X-radiograph of torc A.1 showing the broken iron core inside (radiograph: J. Ambers); c, d) Photomicrographs and e) X-radiograph detail of the chased, punched and filigree wire decoration (Z- and S-twist adjacent pairs) on the rear join 'terminal' of torc A.1

were not etched (to avoid changing the composition), but the microstructures and different compositional phases were observed by SEM backscattered electron (BSE) imaging. Bronze samples from small fragmentary torcs were etched to show grain structures by optical microscopy. Gilded bronzes were examined by SEM-EDX in cross-section and directly on the object surface to identify the gilding method and illustrate wear in places where the gilding was worn through to the underlying bronze. In addition, some of the small multi-wire bronze torcs were mounted in section to study the trapped charred wood stem cores that were found *in situ* from surface examination (see p. 455).

The following sections examine the materials used in the objects from Snettisham: gold sheet (17.3) and wire (17.4), before going on to consider the wider significance of the alloy composition, surface treatments, and colours of these objects (17.5).

17.3 Gold sheet: composition, decoration and use in objects' manufacture

Some of the largest and most visually impressive objects from Snettisham, as well as the most ornately decorated, are torcs made from thin gold sheet. This section deals with the composition and manufacture of gold sheet torcs and torc components, with more detail also given in the relevant catalogue entries (Ch. 14).

The skill of working with sheet gold formed a parallel metalsmithing technology to that seen in the (more numerous) wire torcs. In particular, sheet-working techniques were used to construct large Type 6 tubular torcs (**Fig. 17.4a–e**, see typology in Ch. 13, especially **Fig. 13.5**) found predominantly in Hoards A and F, as well as terminals of various kinds.

In some cases sheet and wire components were combined in a single object: hollow sheet terminals such as F.72 (**Fig. 17.100c–d**) were joined to multi-strand wire neck-rings, as seen on the Grotesque Torc, L.19 (**Fig. 17.98a–c**.). The production of these torc terminals is discussed elsewhere in this chapter (see p. 471).

Construction and decoration of gold sheet objects

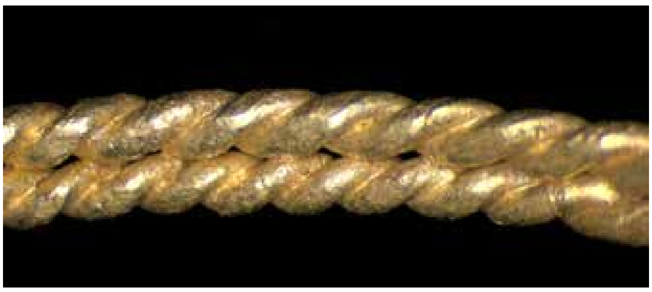
The elaborate decoration on many of the gold sheet torcs at Snettisham was created using a variety of techniques, chief among them chasing, punching and repoussé. These three techniques are types of plastic deformation, meaning that no metal is removed but the distortion is permanent and irreversible (Untracht 1982; Maryon 2011). Chasing deforms the metal sheet from the front side by hammering punches of various shapes across the surface to produce decorative patterns, while punching involves the impression of a single design, usually repeated more than once, by striking a punch with a hammer. Chasing is often applied in combination with repoussé, which entails deforming the metal from the back to create highly three-dimensional shapes and decoration. These techniques were applied in the manufacture of many of the tubular torcs and other sheet components, along with the introduction of other decorative elements such as filigree and beaded wire.

Type 6 tubular torcs

The large Type 6 tubular torcs such as those from Hoard A (Ch. 13, **Fig. 13.7**, and see catalogue entries in Ch. 14) were constructed from a number of sheet components. The terminals of the large Type 6 torcs are separate elements, with some showing evidence for repoussé as well as chased

Figure 17.5 Detail of the uniformly spaced, accurately made, beaded wire on the terminal of tubular torc A.2

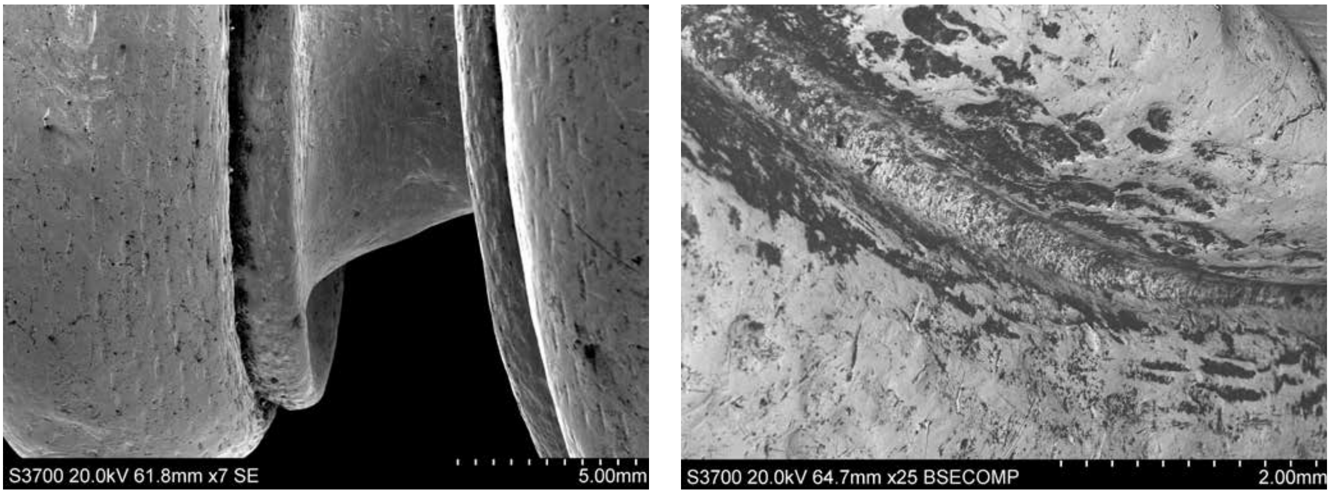
Figure 17.6 Detail of filigree wire (both S-twist adjacent pairs) on separate ring A.7, which is most likely from fragmented tubular torc A.4–6



a

b

Figure 17.7a–b a) Hollow terminal F.48 showing levels of construction, and b) hollow neck-ring F.62 from a similar terminal, showing the internal overlapping tubular sheet construction



a

b

Figure 17.8a–b SEM images of hollow terminal F.48: a) Secondary electron (SE) image of diagnostic tool marks for the shaping and decoration and b) BSE image of the characteristic dendritic surface structure of soldered areas between components. SEM image widths *c.* 15 and 5mm respectively

and punched decoration (e.g. **Fig. 17.4a–e**, and see Ch. 14). These terminals were affixed to the tubular neck-rings, which are made in two parts, each forming around half the circumference of the torc and joining at both the back and front of the neck (**Fig. 17.4a**). The large decorative terminals sit at the front of these torcs, and torc A.1 also has a decorative 'terminal' section at the rear join (**Fig. 17.4a**). The tubular neck-rings themselves were made from thin gold sheet supported by a central iron core (**Fig. 17.4b**), packed with lightweight filler material (now missing), perhaps a mixture of clay, sand and wax (Clarke 1954, 37). Decorative wirework was also incorporated into the tubular torc designs, with evidence for use of beaded wires (Williams and Ogden 1994; Whitfield 2004) on the neck-ring of A.2 (**Fig. 17.5** and Ch. 14), filigree on the rear connector of A.1 (**Fig. 17.4c–e**), and a separate ring (A.7) that may be part of broken tubular torc A.4–6 (**Fig. 17.6** and Ch. 14).

Detailed observations on construction from the scientific analysis of Hoard A are included in the catalogue entries in Chapter 14, where additional images of the object features and metalsmithing techniques described here can be found.

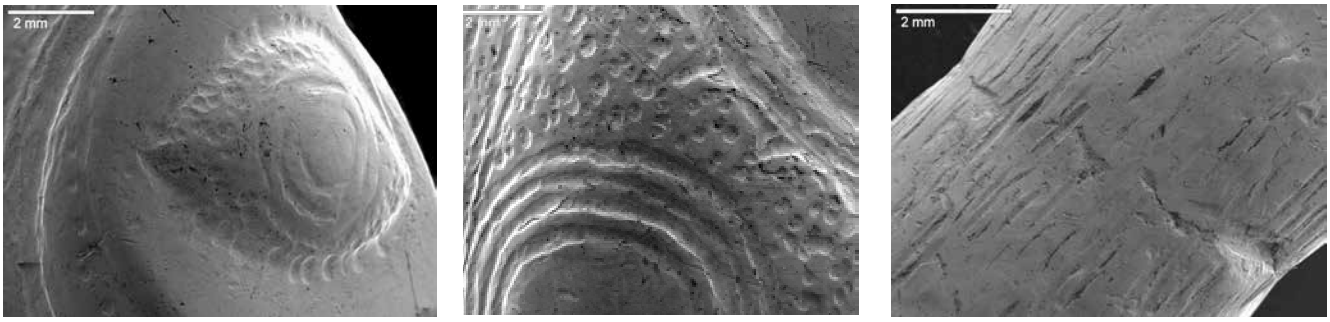
Figure 17.9 Anthropomorphic tubular face terminal S.13 with designs created by a combination of repoussé, chasing and punching

Other tubular torcs

Gold sheet was also used for other types of tubular torc. The manufacturing techniques used were varied and are discussed in more detail on a case-by-case basis in catalogue entries in Chapter 14.

Type 3 tubular torcs (see Ch. 13, **Fig. 13.7**) have multi-component terminals and narrow neck-rings, as seen on F.48, which is made of several pieces soldered together circumferentially to produce the terminal (**Fig. 17.7a**), and F.62, a hollow neck-ring flaring to a trumpet shape, which shows tube-in-tube assembly (**Fig. 17.7b**). Terminal F.48 has a finely punched decorative texture (**Fig. 17.8a**) and dendritic solder joining components (**Fig. 17.8b**).

Some sheet gold tubular torcs, for example the anthropomorphic face terminal S.13 (**Fig. 17.9**) from a Type 4 tubular torc, reveal diagnostic marks and patterns from hammering and shaping the decorative designs using the traditional goldworking techniques of repoussé, chasing and punching (Maryon 2011; Untracht 1982) to create the



a b c

Figure 17.10a–c a) and b) SEM SE image details of the punched and chased design tool marks on the anthropomorphic terminal S.13; c) The linear punched marks cover a solder joint between two joined tubes, perpendicular to the lines of the punch-marks

elaborately detailed anthropomorphic decoration on the torc terminal (**Fig. 17.10a–c**).

Composition of gold sheet

Eleven small sheet torc fragments (one stray find and the others from Hoard F) provided samples for microscopy and analysis (**Table 17.2**). In two cases, samples of sheet are from torc fragments with recognisable terminals, e.g. F.48 (**Fig. 17.7a**), whereas other folded and squashed sheet samples are from less clear torc types, e.g. F.51 (**Fig. 17.11a**). The analysis of the uncorroded core within the cross-sections of the gold sheet samples gives the composition of the original gold alloy used to make the objects. Analysis of the near surface regions of the same cross-sections gives the composition of the surface of the object, which confers the perceived gold colour. Around half of these pieces showed evidence of surface enrichment in gold content compared to their core.

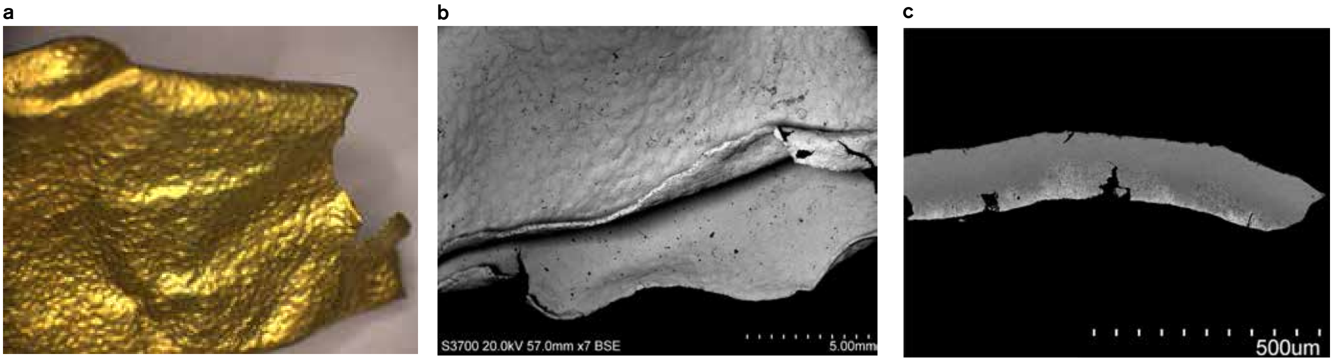
Overall, elemental analysis of the sheet samples showed that the alloys are composed mainly of gold (66–90 wt% Au with an average of 81 wt%) with some silver (8–32 wt% Ag with an average of 17 wt%) and very little copper (1–3 wt % Cu with an average of 2 wt%) (**Table 17.2**). The microstructures of these high-gold, low-copper alloys are composed of a homogeneous single phase which would have provided the required properties for the alloy to be hammered into thin sheet without cracking and further worked into tubular forms and terminals, while retaining sufficient stiffness in the finished objects. Comparison of gold-rich sheet core compositions with those of wires is shown in the ternary diagrams in **Fig. 17.46a–b**, with the sheet alloys being in the upper right region of the diagram, showing high gold and low copper contents. This suggests that alloy compositions for gold sheet were deliberately chosen over, and distinct from, the main alloys used for wire production, most likely for metalsmithing reasons, such as ductility, this being the paramount mechanical requirement for sheet gold production. The high-gold alloy would also be less susceptible to tarnishing and discolouration.

The compositions of the sheet surfaces in cross-section were compared to those of their core bulk (**Table 17.2**). Six of these eleven high-gold alloy samples show no difference in surface composition to the core and no surface microstructure to indicate enrichment. By comparison, the surfaces of the other five (sheet fragments F.19b, F.51, F.52, F.55 and terminal F.48) display different compositions to the cores, with more gold (87–95 wt% Au) and less silver and copper (4–18 wt% Ag and 0.5–2 wt% Cu). The surface enrichment of these sheets appears to be mainly on one surface only and the silver content is significantly reduced, more than might be expected from repeated routine annealing and pickling during the metal forming process (for explanation and discussion of these processes see pp. 431–2 below).

Fragments such as F.51 (**Fig. 17.11a–b**) and F.19b (**Fig. 17.12a**), both of which have very uniformly golden surfaces, are covered with textured punch-marks. Their cross-sections show surface enrichment mainly on one side with associated grain boundary corrosion and some loss of metal in these regions (**Fig. 17.11b–c**). The gold-enriched surface of the folded gold tubular torc sheet F.19b (**Fig. 17.12a–c**) is thicker, highly porous and more uniform in depth. This

Figure 17.11a–c a) Photomacrograph and b) SEM BSE image of a deliberately folded tubular torc neck-ring fragment with punched decoration (F.51); c) SEM BSE image section detail showing irregular surface enrichment (bright areas) on the lower side and grain boundary corrosion causing cracks in the metal. The sheet is 0.13mm thick

a b c



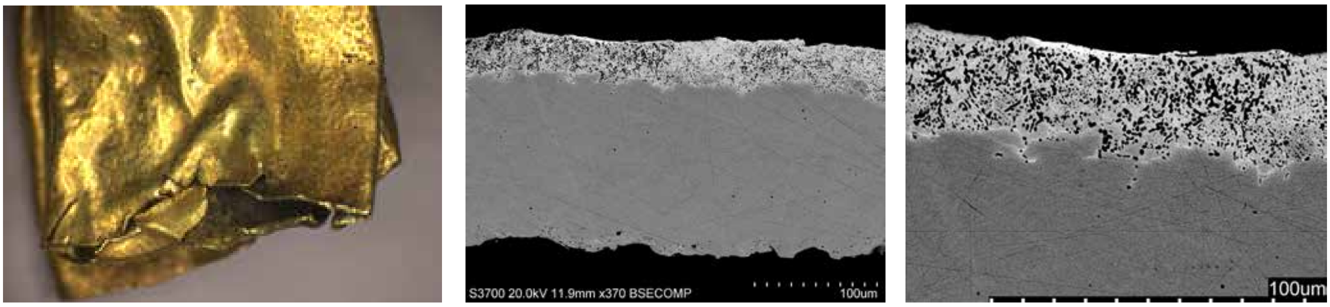
		Bulk composition (wt%)			Surface composition (wt%)		
Cat. no. BM reg. no. (Polished sample no.)	**Tubular torc type**	**Au**	**Ag**	**Cu**	**Au**	**Ag**	**Cu**
S.11b 1991,0407.47 (J1519)	4/5	83.7	14.1	2.2	no surface enrichment observed		
F.37 1991,0501.24 (J1505)	?	84.7	13.3	2.0	no surface enrichment observed		
F.48 1991,0501.27 (J1506)	3	66.1	31.6	2.3	81.9	17.5	0.6
F.62 1991,0501.30 (J1522)	?3	84.0	14.5	1.5	no surface enrichment observed		
F.55 1991,0501.32 (J1507)	4/5	78.5	20.1	1.4	90.1	8.2	1.7
F.51 1991,0501.34 (J1521)	4/5	81.8	15.6	2.6	86.7	11.0	2.3
F.65 1991,0501.36 (J1508)	2	76.5	20.5	3.0	no surface enrichment observed		
F.52 1991,0501.76 (J1509)	4/5	84.6	13.5	1.9	94.9	4.2	0.9
F.53 1991,0501.118 (J1523)	4/5	84.8	13.1	2.1	no surface enrichment observed		
F.49 1991,0501.138 (J1501)	1/2	90.4	8.4	1.2	no surface enrichment observed		
F.19b 1991,0501.161 (J1493)	4/5	76.9	20.5	2.6	93.9	5.6	0.5
mean		81.1	16.8	2.1	89.5	9.3	1.2
min		66.1	8.4	1.2	81.9	4.2	0.5
max		90.4	31.6	3.0	94.9	17.5	2.3

Table 17.2 SEM-EDX analyses of high-gold sheet from torcs (11 samples). Representative area analyses of the bulk compositions and enriched surfaces in polished sections

layer (see **Table 17.2** for composition) has many rounded areas of open porosity with grain boundary enrichment (**Fig. 17.12c**), showing that the surface-enrichment process was done following the hammering of the sheet and the construction of the object. The hammering process would have otherwise essentially squashed the porosity flat, as seen in the case of surface-enriched wires (see below and e.g. **Fig. 17.42**). The cross-section showing the surface microstructure of a sheet fragment from tubular torc terminal F.48 appears similar to sheets F.51 and F.19b (**Figs 17.11–13**). This sheet also measures *c.* 0.16mm thick with loss of surface material associated with grain boundary corrosion on one side, as well as variable thickness surface enrichment in these regions (**Fig. 17.13a–b**).

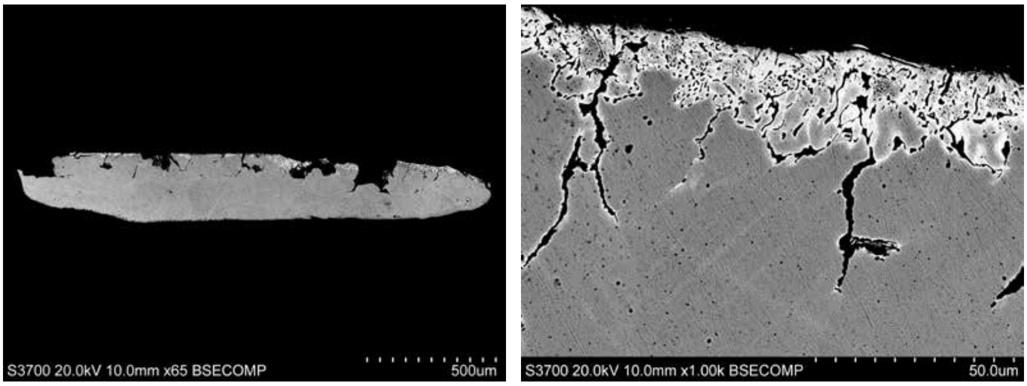
These observations raise the intriguing possibility of deliberate surface enrichment on one side of the sheet only. The Staffordshire Hoard of Anglo-Saxon gold and silver metalwork shows similar effects of surface enrichment on the objects (Blakelock 2016). Corrosion can be dismissed as the main cause here, because the sheet would be corroded equally on both sides.

One possible explanation for a single-sided surface enrichment could be gold parting using salt cementation, a process first used for purifying electrum (a natural gold-silver alloy), especially if carried out on the finished objects, where the outer surface might be exposed to greater chemical leaching than the interior. The microstructure of the sheet-metal samples from Snettisham looks very similar to that of refined gold foils found at the gold-refining site of Sardis (modern-day Turkey) and dated to the reign of the Lydian King Croesus (560–547 BC) (Ramage and Craddock 2000, figs 5.51–4, 146–9). During cementation, gold sheet pieces are heated for a long time to temperatures of several hundred degrees in a sealed ‘parting vessel’ with salt (sodium chloride) in a matrix of sand/clay and charcoal forming a reducing atmosphere (Ramage and Craddock 2000). This process removes silver as well as copper, and the surface analysis of sample F.19b could be interpreted in this manner (**Table**



a b c

Figure 17.12a–c a) Folded gold torc sheet F.19b; b–c) SEM BSE images showing thick surface enrichment on one side, only 0.04mm thick, on a 0.17mm-thick sheet. Only the very surface of the porous gold-enriched layer has been polished. The porosity results from the loss of silver and copper within the alloy (Table 17.2)



a b

Figure 17.13a–b Terminal F.48 sheet cross-section: a) Note the loss of surface material associated with grain boundary corrosion and b) SEM BSE image detail showing the gold-enriched grain boundaries in the enriched zone on one surface

17.2). A similar method is mentioned in La Niece (1995), where gold alloy chisels from Ur (*c.* 2600 BC) are thought to have been surface enriched by a comparable process (Shalev 1993).

Although it is unlikely as the sole explanation, long-term corrosion also has to be considered as a factor for localised micro-enrichment, especially because the porosity in the enriched layer is not heavily burnished (i.e. not compressed by polishing). There is also grain boundary cracking and loss of surface material due to deeply penetrating corrosion in the samples of terminal F.48 and sheet F.51 (**Figs 17.11, 17.13**). The gold-enriched areas appear bright in the SEM BSE images and, deep down, corrosion cracks can be seen in the newly formed cracked surfaces, which would suggest corrosion is at least partly responsible for the loss of silver (Dugmore and DesForges 1979). Nevertheless, whilst some enrichment might be expected due to corrosion from the burial environment (with preferential loss of copper and, to a lesser extent, silver) or due to exposure to the skin during wear, the high level of surface enrichment observed here cannot be explained only by these two phenomena, especially as in many cases enrichment occurs on only one side of the sheet, even at the edge of fragments where both sides would have been equally exposed to the burial environment. In addition, half of the sheet samples with similar bulk compositions showed no surface enrichment, while coming from the same burial environment.

17.4 Wires: manufacture, experimental, gold/silver alloy groups, bronze, and torc case study

This section deals with the huge variety of wires found at Snettisham, their composition and manufacture. The vast majority of torcs from Snettisham are multi-strand types with wires of varying thicknesses and configurations as a major component of their construction. Wires are also used for filigree decoration on two of the large tubular torcs (**Figs 17.4c–e, 17.6**).

The sampled wires display a range of very different colours, from silvery to rich yellow-gold, and a variety of sections, from circular, to faceted, to square. Their outer colour is a feature of the composition of the surface, but, in many cases, it may not represent the composition of the original core metal because of surface enrichment, hence the need to sample the wires in full cross-section for metallography and analysis (see methods section, p. 420).

The wires found at Snettisham range from 0.6mm to just over 10mm in thickness. All have the physical evidence of mechanical deformation and faceting from being hammered from shorter, thicker primary rods/ingots, lengthening these into smaller diameter long wires. Evidence for this can be seen in the multiple faceting along the length of the wires (e.g. torc fragments S.34–S.39) and a seam and overlapping metal smears, visible in places on many wires (e.g. see **Figs 17.14–15**). All these features were created by repeated cycles of hammering (plus annealing and pickling – for explanation and discussion of these processes see pp. 431–2 below) during wire production and have been reproduced by experimental metalsmithing (see p. 433 and e.g. **Fig. 17.20a–b**). None of the wires show evidence of being drawn (i.e. no multiple linear striations from a draw-plate) (Untracht 1969).

The surface condition of the wires varies from smooth and uncorroded for the high-gold alloys to a number displaying severe stress corrosion cracks (Dugmore and DesForges 1979) with brittle and flaking surfaces caused by the residual stresses in the metal from twisting during

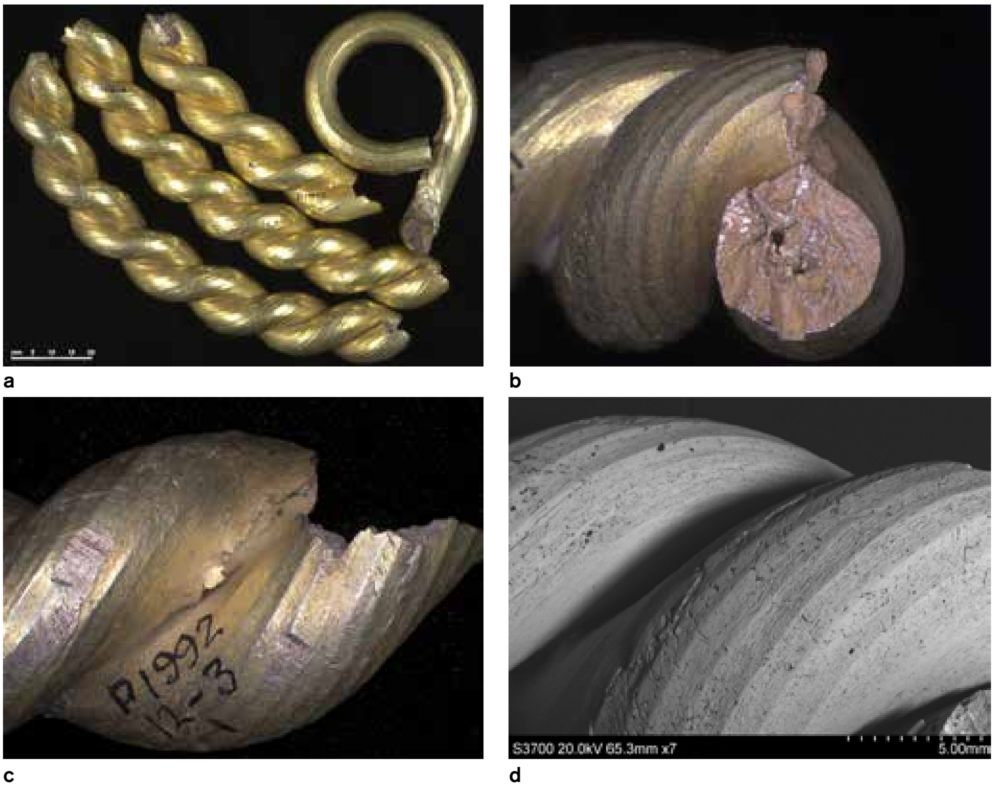


Figure 17.14a–d Broken fragments from torc S.31–S.39. a) Photomacrograph (scale 20mm), b, c) photomicrographs and d) SEM BSE image of the thickest wire torc fragments with multiple parallel facets from hammering running down the full length of the wires. b) Note the split running half-way through the section of the fractured end from the surface to the centre, leaving a hole in the centre, and the thin overlapping folds of gold and more coppery-coloured sub-surface metal

manufacture and wear (**Figs 17.40d, 17.33a–b**). The effects on the wire surface are a direct result of the composition of the alloys used, in particular the alloys with low proportions of gold and silver, which are subject to corrosion during burial.

This section begins with general observations on the manufacture of wires, followed by a description of the extensive and illuminating experimental wire manufacture carried out by practising metalsmith John Fenn, and the application of the results to the interpretation of the material from Snettisham.

There is significant variation in the alloys used to produce the wires found at Snettisham, and thus the rest of this section is divided according to alloy composition. The core microstructures of the wires may be divided into four main alloy types based on the relative gold/silver/copper bulk concentrations (**Tables 17.4–6**): high gold-silver low copper alloys (p. 437), silver-gold-copper alloys (p. 439), high-copper low-gold silver alloys (p. 440), and copper alloys lacking any significant gold or silver content (p. 441).The high gold-silver with low copper alloys are a homogeneous solid solution (e.g. **Fig. 17.26a–d**) and, by contrast, both the silver-gold-copper and the silver with high-copper and low-gold alloys have finely dispersed two-phase eutectic microstructures (e.g. **Figs 17.29–30**).

The final part of this section draws together the various aspects of wire analysis and production to present a detailed discussion of the composition and manufacture of the wire elements of torc F.119–20.

Figure 17.15 Torc L.13 with thin wires, *c.* 2mm diameter, showing longitudinal faceting with a deep linear groove and smeared overlap metal from hammering

Manufacture of wires

Wires were produced in a variety of thicknesses and with varying cross-sections depending on the design requirement of the torcs. The examination of wires by microscopy, analysis and experimental wire forming allows us to interpret the manufacture and surface treatment of the wires. Making both thick and thin torc wires was a similar process, involving cycles of hammering a rod to reduce its diameter and elongate it into a thinner wire, followed by annealing to soften the metal, quenching, and then pickling to remove oxide discolouration. The cyclical process of hammering, annealing and pickling is halted once the desired wire thickness is achieved (Maryon 2011; Untracht 1982) and the wires can then be finally polished to a shiny smooth finish, as required. Some square-section wires were also twisted individually to give a spiral effect.

The process

Wire was started from a cast rod/billet or block of appropriate length and girth, which was hammered on an anvil (probably of iron) with frequent annealing, to elongate

Figure 17.16 Detail of torc L.2, with neck-ring formed from tightly plied, thick, faceted rods, 7.1mm in diameter

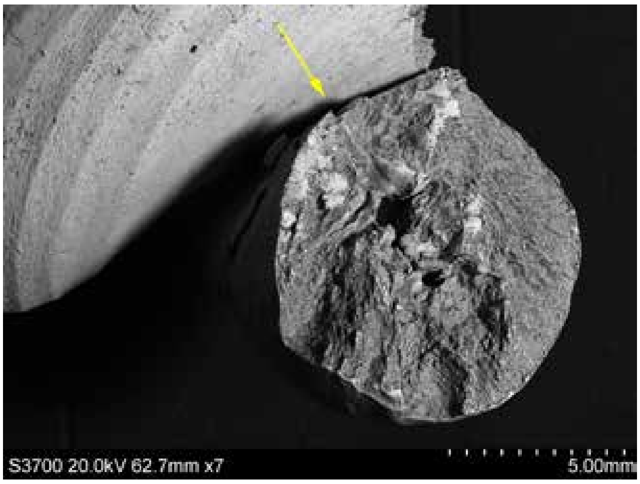


Figure 17.17 SEM BSE image of a broken fragment from torc S.31–S.39. Thick wire showing a groove extending from the surface (arrow) to the centre where it appears more as two holes (see also Fig. 17.14a–d). Note the linear hammered facets on the wire. The brighter areas at the edge of the fractured surface are where the thin gold-enriched surface layer has folded inwards when the wire broke

the metal to the required length and at the same time reduce the thickness. Hammering to the desired section diameter and form would be done in a sequence of repeat operations in which the thickness of the original square rod/wire was reduced in each hammering cycle by up to *c.* 40% (see experimental wire production section, p. 433).

An example of a small (5cm) cast linear ingot was found in Hoard B/C (B/C.85), and others in Hoard F (F.438–40). The size of the ingot used as a starting point likely varied depending on the desired final length and thickness of the wire. The thickest fragmentary torcs (such as S.31–S.39, with a wire diameter of around 9mm, **Figs 17.14, 17.32**) show that thick rod-like ingots must have been made as a starting point for those wires. At the other end of the scale, two multi-strand wire torcs/bracelets F.135 and F.156 with much narrower wire diameters (1.8mm and 1.3mm respectively) show evidence of residual dendritic cast microstructures (**Figs 17.30–1**), which is unexpected considering the extensive hammering thought to be necessary in preparing them. In these cases, it may suggest that relatively long, thin ingots were cast to reduce the amount of hammering required to produce the narrow wires.

Consultation with a practising metalsmith (see p. 433 below), suggested that even for producing round-section wires, it is far easier to first hammer square-section rods/wires. This was achieved by hammering along a length of the metal on an anvil, producing an oblong section, then turning through 90 degrees and repeating the hammering along the other side to square it up again and so forth. It is more efficient and quicker to work the wire this way than trying to hammer round-section wires directly by constantly rotating the ingot during hammering. This is also the case for the thinner wires and accounts for why so many wires of all thicknesses have either clear or residual evidence for longitudinal facets. Thus, thick wires with multiple linear facets, for example the octagonal-section wires of torc L.2 (**Fig. 17.16**), were made by hammering a square-section rod/wire along the apex corners onto an anvil thereby producing pairs of flat faces for each pass of the hammer along the rod. Hence, an octagonal rod/wire is easily produced from a square-section rod.

In the case of thick wire torc L.7 (**Fig. 17.59a–b**), the final wire is essentially of circular section. This required careful hammering with much rotation of the wire in the finishing process to remove the linear facet corners generated by initially hammering flat faces and thus create the roundness along the entire length. These facet corners were, however, not fully removed, as they appear in protected areas between twists. Some of the smoothing observed on the wires is therefore due to polishing of the finished torc and use wear (Ch. 20).

Many wires of varying thickness and section have an apparent single seam that runs along their length. This seam is clearly seen in the fractured ends of the thickest torc fragments, e.g. S.31–S.39 where the surface seam is in fact a crack along the length of the wire that reaches right to the centre of the wires, where it opens out forming a hole (**Fig. 17.17**). This feature is also seen on torc F.5c (**Fig. 17.18a–b**).

This crack was most likely formed by preparing a hammered strip of metal, then folding and hammering it along its entire length to double its thickness. The reason for this may be that it facilitated the twisting/plying together of thick wires (see section below on neck-ring construction, p. 454), as the overlapping internal folds would tend to slip over each other, avoiding the need for more effort to deform the thick solid core.

Annealing and surface enrichment of wires

During the process of hammering, the metal would gradually become brittle and less ductile, a process known as work hardening. The metal would therefore have required frequent annealing to prevent it cracking from over-hammering, as the wire reached its limit of plasticity. Annealing refers to heating some way above recrystallisation temperature (*c.* 350–400 °C) (in practical terms at dark red temperature *c.* 550–650 °C, **Table 17.3**). This reorganises and recrystallises the metal, releasing the accumulated internal stress and deformation of the crystal lattice, by re-forming new equiaxed grain boundaries. Without annealing, further hammering would increase stress between grains until fractures started propagating through

a b

Figure 17.18a–b a) Detail of thick torc fragment F.5c (from mixed group in b) showing an exceptional deep groove into the core (see also Fig. 17.1)

the crystal lattice of the metal, ultimately leading to a break. No further elongation of cracked, hard and weakened metal could then be made, thus preventing the possibility of further reduction to thinner wires. Annealing softens the alloy, restoring its ductility, which is its ability to be hammered further to extend the wire length without cracking, and malleability, or ability to reduce its diameter while maintaining its rounded section shape. Annealing is particularly important for the less ductile and less malleable lower gold content alloys.

Quenching likely followed annealing to retain the microstructure resulting from high-temperature annealing; this would be achieved by plunging the hot metal into cold liquid. Pickling involves soaking the annealed metal piece in a mild acidic medium to remove surface oxidation, which would result in a clean, shiny/matt metal and microscopically porous surface. (Pliny in his *Natural History*, Book XXXIII, Chapter 20 (on metals) describes the method for annealing and pickling: '… the copper is first well hammered, after which it is subjected to the action of fire, and then cooled with a mixture of salt, vinegar, and alum. It is then cleansed of all extraneous substances, it being known by its brightness when it has been sufficiently purified.')

The precise details of the wire-making process likely varied depending on the alloy used. For example, gold-rich wires may have required less annealing, as they would have been less prone to stress cracking. In the case of wires with a higher copper content in their alloys, pickling in acid would have been necessary to remove the black copper oxide that forms on the wire surface during annealing.

The cyclical combination of hammering and annealing with pickling creates surface enrichment of gold and silver in the Snettisham wires, seen especially in the alloys with lower proportions of silver and gold in their core metal, i.e. the higher copper alloys lose much of the surface copper in this process (see **Figs 17.24, 17.43–4** element maps below). Essentially, this enrichment occurs as part of the wire-making process. The long and repetitive cycles of hammering, annealing and pickling would have progressively enriched the surface of the wire in gold and silver without any additional process and resulted in the variety of colours observed. The wires would transform from a red-coppery colour to a golden or pale gold-silvery one, depending on the original core composition. Some broken ends of wires clearly show the copper-rich core metal and the enriched golden surface (e.g. **Figs 17.43–4**). This phenomenon of surface enrichment in wires was duplicated in experimental wire production. It is considered in detail for different alloys below (p. 432) and summarised in the section on alloy composition, colours and surface treatments (p. 452).

Other tools for wire production

There is no evidence for drawn wires at Snettisham. The technique of wire-drawing was commonly used from around the 10th–11th centuries AD (Oddy 1977), although evidence for the technology may date back to as early as the Late Bronze Age period (Northover 1995b), and drawn iron wire has also been attested in Late Iron Age mail armour (Özşen and Willer, 2016).

It has been suggested that grooved anvils (also called swage blocks) could have been used to help shape the faceted wires and this has been described for the Ipswich torcs (Brailsford and Stapley 1972). Like many metalsmithing

Table 17.3 Annealing temperatures of common gold alloys

Alloy	Annealing temperature °C	Colour
Pure gold, 24 carat	200	Black heat
21–22 carat (alloy containing approx. 90% gold)	550–600	Very dark red
18 carat (alloy containing 75% gold)	550–600	Very dark red
14 carat (alloy containing 58% gold)	650	Dark red
Sterling silver (alloy containing 92.5% silver)	600–650	Dark red

Figure 17.19 Experimental wires (John Fenn). Top is the stepped square-section copper rod, 6mm, 5mm, 3mm down to 2.5mm circular-section. Centre: plied 2.5mm circular-section wire with loop used for twisting with mandrel. Bottom: piece of the silver-copper alloy wire used for the enrichment test

processes, there are a number of ways of achieving the same result. The problem with the swage block hypothesis is that, in the whole collection of torcs and fragments from Snettisham, there are many different numbers of facets on many different thicknesses of wire and, hence, this would mean needing as many different accurately grooved swage block grooves to account for all of the variations found. This is not impossible as swage blocks are known from the Bronze Age (Bass 2005), but perhaps unlikely here. There remains the possibility that a few standard-sized swage block grooves may have been in use during part of the wire preparation process, but experiments in making hammered wire (see below) show that hammering alone adequately explains the mechanical features found on the Snettisham torc wires.

It has also been suggested anecdotally that the stone with a hole found at Snettisham (A.8) may have been used for drawing wire. Rainbird Clarke (1954, 39) noted that it seemed likely from the grooving on the pebble that 'metal has been drawn through the aperture', suggesting its use in the breaking down and reforming of tubular torcs into other ornaments. This is very possible, though the use of the pebble more specifically as a 'draw plate' is unlikely because the dimensions and geometry of the entry hole necessary for the mechanics of wire drawing are very precise (Changsun Moon and Naksoo Kim 2012). However, the stone could have served as a gauge to size wire; some sort of simple gauge would have had great practical use.

Bronze torc/bracelet fragment F.361 (**Figs 17.37–8**) has a group of very deep parallel grooves running lengthwise that cut into parts of the wires. These are relatively more prominent and numerous than on other torc wires. This raises the possibility that the wires may have been pulled through some form of final shaping perforation, with rough edges, or have been filed or scraped with a coarse and sharp instrument as part of the finishing process of the wire. But in this case, it seems to have caused surface damage rather than achieving a smooth finish. Other areas on the same wires are smoothly polished. The grooves look very sharp – more like cuts from a hard, metallic instrument rather than from a coarse stone instrument (**Fig. 17.38**). Examples of broadly similar striations on Iron Age silver rings are reported from the Palacio hoard in southern Spain (Murillo-Barroso *et al.* 2015) and tentatively interpreted as the result of a final potentially similar pulling process to even the diameter of the wires.

Experimental wire manufacture

John Fenn, practising metalsmith

As we have seen, the Snettisham wires have two common features: facets and smears run along the length of many wires of all diameters and, generally, the wires are surface enriched. Experiments were carried out to make reproduction wires for comparison and to record the sequence and timing of each step, and overall duration of processes.

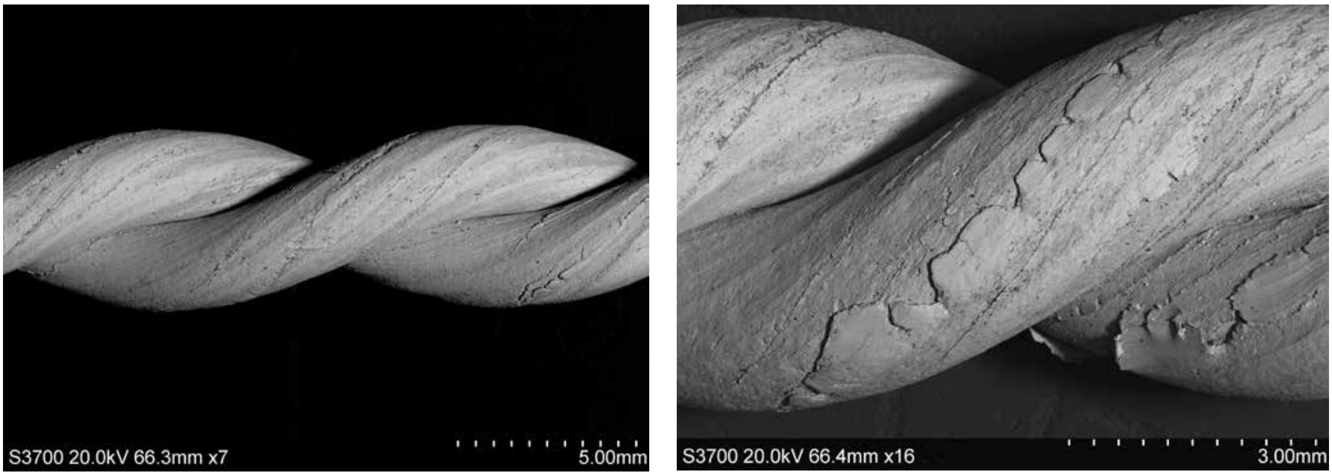
Three experiments were carried out:

1. Hammering a square-section copper rod in stages to a round-section wire.
2. Making a uniform thickness 2.5mm circular-section wire and twisting/plying it into a two-ply structure.
3. Hammering, annealing and pickling a silver-copper alloy wire to test for surface enrichment.

Hammering a square section of copper rod

Using a square rod from the start is a most important practical finding in the procedure for efficiently making circular-section wires. It is far easier and quicker to elongate a square rod to a square wire than trying to maintain a circular-section wire continuously from the start while hammering. With every two passes of the hammer along the wire the square section is maintained. As the wire thins, turning the square edge-on and hammering along the square corners produces eight flat facets along the wire. Many of the Snettisham wires have evidence of long flats or facets from this hammering technique. When the rod reaches about 3mm square, round wire naturally starts to form during hammering.

Thus, the starting point for making 2.5mm *circular-section* wires were 6mm *square-section* 14cm-long rods. These would extend on hammering and annealing in stages to a length of 92cm, enough to make a simple Stage II torc neck-ring formed from a double length of the wire plied into a two-ply structure (**Fig. 17.19** middle) (details below). A 'stepped' experimental wire (**Fig. 17.19** top) shows a sequence of successive hammered stages from the thick starting rod (6mm, 5mm, 3mm, down to 2.5mm circular section). The



a b

Figure 17.20a–b SEM BSE images of experimental hammered and twisted wire. Note the facets along the wires and the flakes and smears that occur during hammering, reproducing those found on Snettisham wires (see also cross-section in Figure 17.22)

first hammered step reduced the thickness by 18%. After annealing, the next sequence reduced this to 3mm square (a reduction of 40%) without signs of overworking. It took 20 minutes to make the stepped example piece, including annealing.

Uniform thickness copper wire manufacture

Using a 1kg hammer with a transverse long convex face about 13mm wide, about three to five hammer blows a second were used on a copper alloy rod on a slightly convex anvil. The hammer was dragged slightly in the direction of elongation at each blow to increase the reduction by almost a quarter. The convex hammer face helped continuously spread the metal rod out lengthways from the impact point and rapidly facilitated elongation of the wire. By comparison, a flat hammer tends to spread the wire sideways only. No special care was needed during hammering while the metal was thick enough to maintain its square section without twisting. As the bar thinned to around 3mm square, the long unsupported length started to twist and deform, and a lozenge section developed. At this point, it took some skill to get back to the square section. This is the stage of hammering when circular-section wire naturally starts to form.

During hammering, the surface of the wire flaked or smeared (**Fig. 17.20**), a feature seen on many Snettisham wires (**Figs 17.21, 17.33**); these tend to split away when the wire is later twisted/plied. The wires were hammered along their length twice between most annealing steps that were done at red heat (*c.* 750 °C) and then quenched. The variable thickness of the wires was seen easily when annealing began, the thinner sections becoming red some time before thicker parts. Flaking may derive from the same square corners being retained throughout all the stages of reduction. Sharp corners are effectively unsupported and become stressed and vulnerable during the radical elongation. Possibly, knocking corners back or reducing sharpness might reduce flaking.

Times of hammering to make 92cm of 2.5mm diameter copper wire (annealing and quenching was carried out between each stage):

- First stage: Starting length 14cm, 6mm square. Hammering for 2 minutes, length now 17.2cm. Increase: 3.2cm.
- Second stage: Hammering for 4 minutes, length now 21.6cm. Increase: 4.4cm.
- Third stage: Hammering for 2 minutes, length now 28.6cm. Increase: 7cm.
- Fourth stage: Hammering for 3 minutes, length now 33cm. Increase: 4.4cm. The section began to become lozenge-shaped and was corrected with more hammering.
- Fifth stage: Hammering carefully for 7 minutes, length now 38cm. Increase: 5cm. The section, measured for the first time, is approximately 4 to 3.5mm square.
- Sixth stage: Hammering for 3 minutes, length now 43.8cm. Increase: 5.8cm. The metal section went out of square; a small planishing hammer was used to correct the whole length. This took 5–6 minutes, leaving the wire still 43.8cm long, and the section approximately 3mm square.
- Seventh stage: Using a large hammer for 6.5 minutes to give a length of 48.3cm. Increase: 4.5cm. Section still approximately 3mm square.
- Eighth stage: Hammering for 6 minutes, now 54.6cm long. Increase: 6.3cm
- Ninth stage: Hammering without annealing for 7 minutes, length 59.6cm. Increase: 5cm. The cross-section remains, curiously, still about 3mm square.
- Tenth stage: Last square section. Hammering with a large hammer for 11 minutes, length 68.6cm. Increase: 9cm. The section is now 3mm to 2.75mm square. To this stage it has taken 57 minutes of hammering, not including annealing. The whole time including annealing was 1 hour 43 minutes.
- Swaging: 1 hour using a flat hammer and a single grooved lower swage. Length now 89cm. After annealing, the wire was approximately 2.5 to 3mm diameter round and was stretched manually by 2.5cm to a length of 91.5cm. This wire demonstrates uneven thickness. A further 20 minutes was spent making adjustments and finishing.

Total time using a heavy cross-peen hammer to hammer out 91.5cm of approximately 2.5mm copper wire from 14cm rod, 6mm square was, in this attempt, 2 hours 20 minutes. The Snettisham Great Torc contains very approximately

19m of wire (64 individual strands of 1.6mm diameter and perhaps around 30cm in length). Therefore, based on this experimental work, a rough approximation for the time it may have taken to make the wires for the Great Torc, is about 50 hours in total, say one week for an individual, to hammer out 19 metres of wire (admittedly thinner than the test wire), although it is entirely feasible that a small group of workers might make the wire for a large torc in possibly less time.

The wire was finished by hammering with a flat-faced hammer and flat stake to achieve the best uniformity, and finally it was hammered into a simple bottom swage to facilitate the lengthening of the wire and some correction of the thickness. This took an hour to refine the form of the 92cm-long wire. It was then annealed followed by light corrective hammering on an anvil. Small sharps that appeared were occasionally smoothed with a stone.

For the first attempt at plying two strands of wire together, the experimental wire was first doubled back on itself and the two halves then twisted together without a final anneal, but this produced an uneven twist. While the thickness of the finished test wire appeared to be even, in fact it varied in thickness, which caused the uneven twist to develop, with the slightly thicker regions twisting less than the thinner ones. Thinking that this was due to unevenly work-hardened metal, the thicker wire region was annealed and twisted again – but this increased the problem.

For the second attempt, the wire was prepared for twisting by an even annealing, then lightly smoothed using a stone, papered and finally burnished with a steel tool to produce a bright finish. Twisting again using an iron bar in the loop (at the doubled wire centre) and straining back to tension the wires produced the plied wire in **Figure 17.19**. However, it still remained somewhat unevenly twisted after four or five additional turns, owing to the slightly variable wire thickness along the length (2.5–3.0mm). By chance, when the original straight wire was folded double before twisting, wires of similar thickness lay adjacent to each other. The importance of this is that if regions of thick and thin wire were alongside during twisting, the thinner wire would tend to wrap around the thicker rather than twisting uniformly together, thus producing a very uneven result. In this case similar thicknesses were adjacent on the final twisted wire, so this did not happen, and the result was a good representation of plied pairs of wires from Snettisham.

This practical difficulty in producing a uniform thickness of wire highlights the quality of the original Snettisham wires and the precision of the metalsmiths in producing so much wire of routine uniformity throughout the wire size ranges.

Silver wire enrichment experiment

It was suggested above that the silver/gold-rich surfaces of the Snettisham wires are the result of copper depletion during the pickling that followed multiple hammering and annealing/quenching stages during wire production. The relatively low number of hammering and annealing cycles taken to produce copper wire showed minimal oxide build-up. Therefore, in order to test the hypothesis of surface enrichment of a silver-copper-gold alloy by repeated

Figure 17.21 Snettisham torc/bracelet wire F.154 showing the smeared flaking caused by hammering the wire

hammering, annealing and pickling using a similar production sequence, we conducted the following experiment.

A representative alloy was made of approximately 70% silver and 30% copper, typical of the Snettisham high-copper silver alloys (see pp. 440, 446 **Table 17.6**), but without gold, and formed into a 5mm square-section rod. This was repeatedly hammered, annealed and quenched to produce wire with facets in the same manner as the copper wire test (above) to see if silver surface enrichment occurred.

At first the 5mm square rod elongated only 10mm at each stage. The alloy remained ductile to begin with, but, towards the end, it was difficult to maintain the perfect square section; then the hammering became more severe and less regular, the metal became stiffer and in fact less responsive to the bright red annealing temperature. It took approximately 13 two-minute hammering sequences to complete the wire from the rod.

Following each hammering stage, the first five annealing steps were done at dull red heat. However, to maximise the chance of producing a silver-rich surface by oxidising the copper, the remaining nine stages were annealed as hot as could be safely done on the thinning wire, at about bright red heat. After each annealing step, the wire was quenched in fairly strong acid pickle (240ml of vinegar to 17g of salt), and to further enrich the surface the last three stages involved boiling in the pickle, first for 5 minutes then for 8 minutes and, after the final hammering, for 17 minutes.

In all, the wire was made in 33 minutes and was 22.5cm long. As an indication of copper loss (and/or possibly silver loss) during the 13 hammering and pickling stages, the wire was weighed before and after the procedure. The total original weight was 12.46g with a loss of about 0.36g (approximately 3 wt%). Calculations show that this weight loss over the large surface area of the wire (1400 square millimetre surface area of 2mm diameter) would account for several microns depth loss of surface copper – essentially a silver-enriched layer of this thickness.

SEM microscopy of the sampled wire in cross-section confirms this very clearly. An enriched layer *c.* 6 microns thick was produced simply by these repeated cycles of hammering, annealing and pickling during the wire-making process (**Figs 17.22–3**).

The silver-rich layer is remarkably solid and uniform with only very fine residual porosity and has a clear continuity

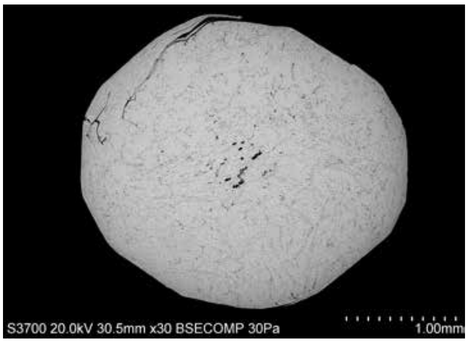


Figure 17.22 SEM BSE image of the cross-section of the experimentally made high-copper silver alloy wire. Note the multiple flat facets on the wire section and the smeared overlap. The copper-rich phase of the eutectic alloy is darker than the bright silver-rich phase

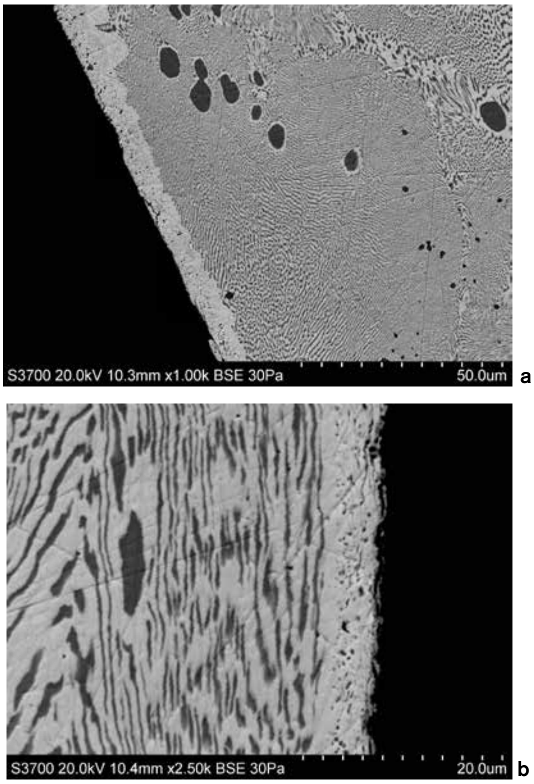


Figure 17.23a–b SEM BSE images at higher magnification of the experimentally made 70 wt% silver/30 wt% copper alloy wire. Details (a) x1000 and b) x2500) clearly show the 6-micron-thick surface-enriched layer that formed during the wire manufacturing process. Note the well-defined solid layer directly on the underlying core metal. The darker core phase is rich in copper. The brighter silver phase is continuous between the enriched surface layer and core phase

with the silver phase of the underlying core metal, just like the Snettisham wires (see below, pp. 443–7). The progressively enriched layer was clearly compacted from successive hammering phases, thus removing the porosity from the loss of copper of the two-phase alloy. The compressed microstructure shows no evidence of further dissolution of copper from the copper phase of the core alloy beneath. This suggests that the final 17-minute pickling carried out after the final hammering was unnecessary and that all of the enrichment was achieved during the dynamic phases of the wire-making process. Essentially, the silver layer had formed a passivating barrier between the pickling solution and the sub-surface core metal (**Fig. 17.23**).

The SEM-EDX elemental X-ray distribution maps of the cross-section illustrate the clear compositional change that occurred during the wire-making process, with the enrichment of silver on the surface because of the depletion of copper compared to the two-phase eutectic core alloy (**Fig. 17.24**).

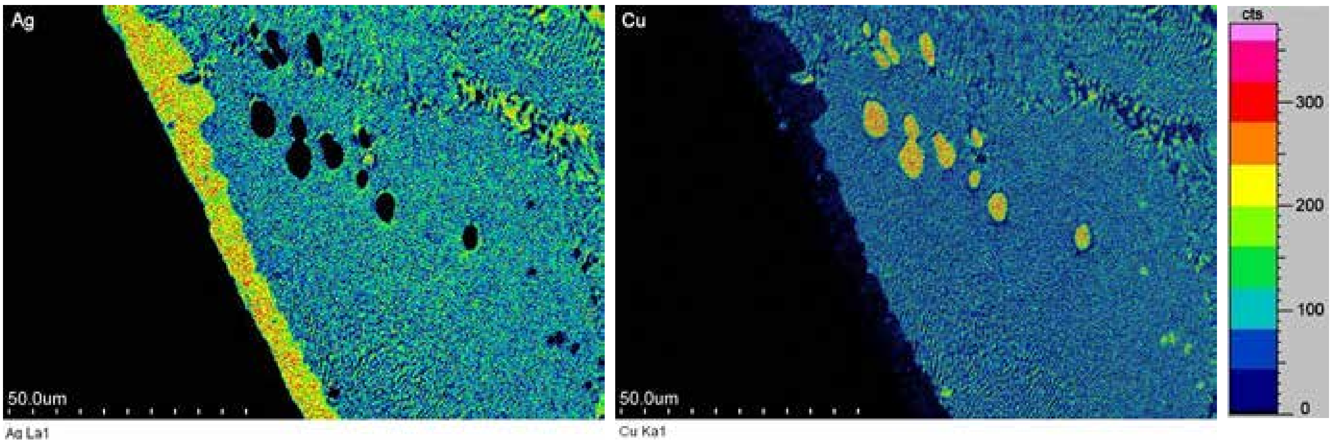
In sum, the experimentally hammered high-copper silver alloy wire produced surface enrichment that formed progressively as a natural part of the dynamic wire manufacturing process through cycles of hammering, annealing (with oxidation of copper on the surface) and pickling (removal of copper oxide from the surface).

Repeated hammering to further extend the wire compresses the porosity left by the removal of copper oxide. Clearly, the composition of the wire alloy affects the amount of surface enrichment and thickness of the enriched layer; so do variations in the hammering/annealing cycles for any given wire. Overall, the experimentally surface-enriched wire looks very like the Snettisham wires of similar microstructure and composition (e.g. **Fig. 17.25**, F.116; and **Fig. 17.31**, F.156), the alloys of which also contain gold and

Figure 17.24a–b SEM-EDX elemental distribution maps for silver and copper acquired on the cross-section of experimentally made 70 wt% silver/30 wt% copper wire (see Fig. 17.23) for: a) silver, showing the silver-enriched surface layer, and b) copper, which is completely depleted from the surface. Note the eutectic core alloy showing both silver and copper. (NB: Colours are relative concentrations of the element in each image: yellow/orange higher and blue/green lower) (x1000, image width *c.* 125 microns)

a

b



are enriched in gold and silver at the surface and depleted in copper (**Table 17.5**).

The following sections present microscopic and analytical observations from the Snettisham wires themselves and from polished specimens according to alloy composition, beginning with high gold-silver with low copper alloy wires (p. 437), and moving on to consider silver-gold-copper alloy wires (p. 439), high-copper and low-gold silver alloy wires (p. 440), and bronze wires (p. 441), finishing with a detailed case study on the wires of multi-strand torc F.119–20 (p. 443).

High gold-silver low copper alloy wires

Twelve wire samples have core alloys made of a homogeneous solid solution (e.g. **Fig. 17.26**) rich in gold and silver and poor in copper, with nine showing some gold enrichment on the surface. Nine samples have lower silver and copper concentrations in the enriched surface layer (**Table 17.4**), with some showing very similar microstructures to the enriched gold sheets (see p. 427), i.e. porosity and grain boundary corrosion. Perhaps corrosion during burial is superimposed on the effects of a putative 'refining' type of ancient surface treatment (Ramage and Craddock 2000; Blakelock 2016), as argued above for gold sheet.

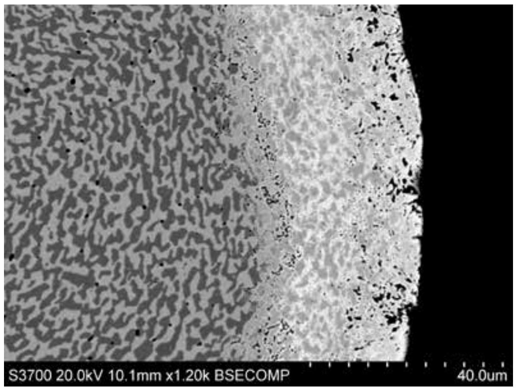


Figure 17.25 SEM BSE image of Snettisham torc wire F.116 with eutectic core and thick enriched surface

Torc/bracelet F.88 (**Fig. 17.27**) has the thickest gold-enriched surface layer of any of the sampled high gold-silver with low copper alloy wires, despite its low copper content and high gold and silver contents, which would make it difficult to surface enrich by the simple method of oxidising the copper during annealing and pickling (see above, pp.

		Bulk composition (wt%)			Surface composition (wt%)		
Cat. no. BM reg. no.	**Polished sample no.**	**Au**	**Ag**	**Cu**	**Au**	**Ag**	**Cu**
S.11a 1991,0407.57	J1517	79.8	16.7	3.5	85.3	12.1	2.6
F.34 1991,0501.16	J1503	73.9	22.8	3.3	75.6	21.6	2.8
F.94 1991,0501.17	J1502	71.3	24.6	4.1	81.6	16.8	1.6
F.88 1991,0501.22	J1504	51.7	42.4	5.9	79.0	20.7	0.3
F.5d 1991,0501.56	J1513	68.7	27.0	4.3	83.5	15.6	0.9
F.5e 1991,0501.57	J1515	73.4	23.7	2.9	85.6	12.1	2.3
F.85 1991,0501.95	J1525	94.0	5.4	0.6	no surface enrichment observed		
F.9a 1991,0501.125	J1494	57.2	37.1	5.7	77.1	22.2	0.7
F.9c 1991,0501.127	J1495	71.6	25.0	3.4	81.9	16.4	1.7
F.160 1991,0501.192	J1536	60.4	35.8	3.8	72.4	26.0	1.6
F.146 1991,0501.214	J1529	79.7	16.9	3.4	no surface enrichment observed		
F.17a 1991,0501.216	J1533	81.6	15.9	2.5	no surface enrichment observed		
mean		71.9	24.4	3.6	80.2	18.2	1.6
min		51.7	5.4	0.6	72.4	12.1	0.3
max		94.0	42.4	5.9	85.6	26.0	2.8

Table 17.4 SEM-EDX compositional analysis of high gold-silver with low copper alloys (12 wire samples). Representative area analyses of the bulk compositions and enriched surfaces in polished cross-sections. Compositional data plotted on Au/Ag/Cu ternary diagrams in Fig. 17.46

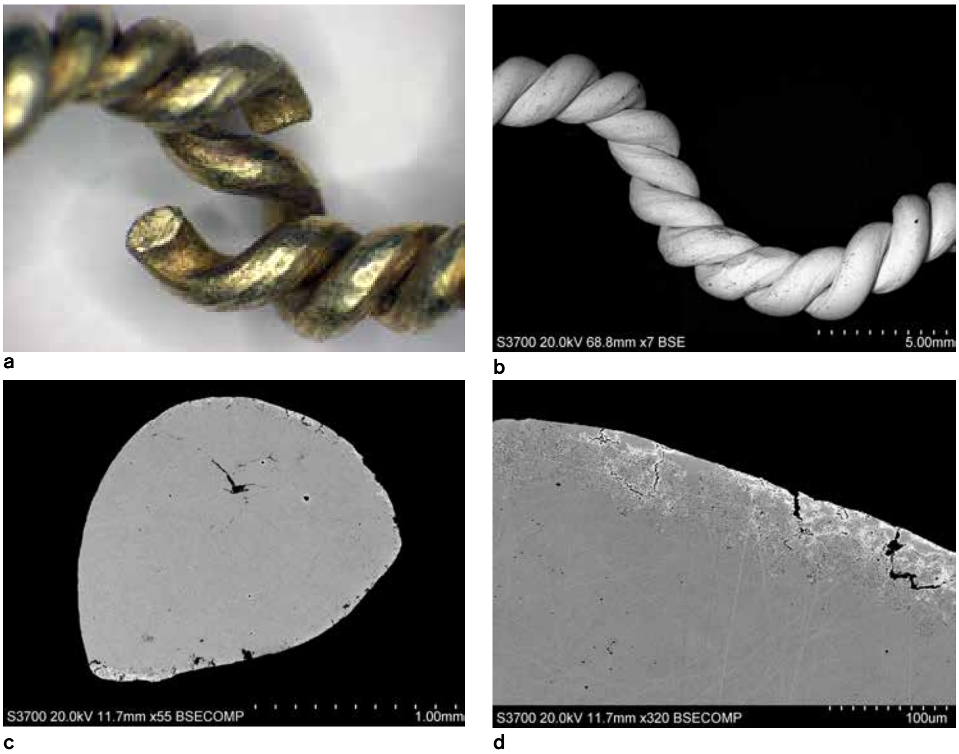


Figure 17.26a–d a) Photomicrograph and b) SEM BSE image of gold-coloured wire torc/bracelet F.160; c) and d) SEM BSE images of a cross-section showing the core alloy being a homogeneous single-phase solid solution with high gold and low copper contents, and the brighter surface area being gold enriched. Note the smoothly worn surface of the wire on the left side of the wire cross-section in c) from heavy wear that has worn away the gold-enriched surface, and the absence of the original gold-enriched surface lost in this region. Torcs were functional objects which experienced a great deal of use. The use wear traces seen on objects from Snettisham are discussed extensively in Chapter 20

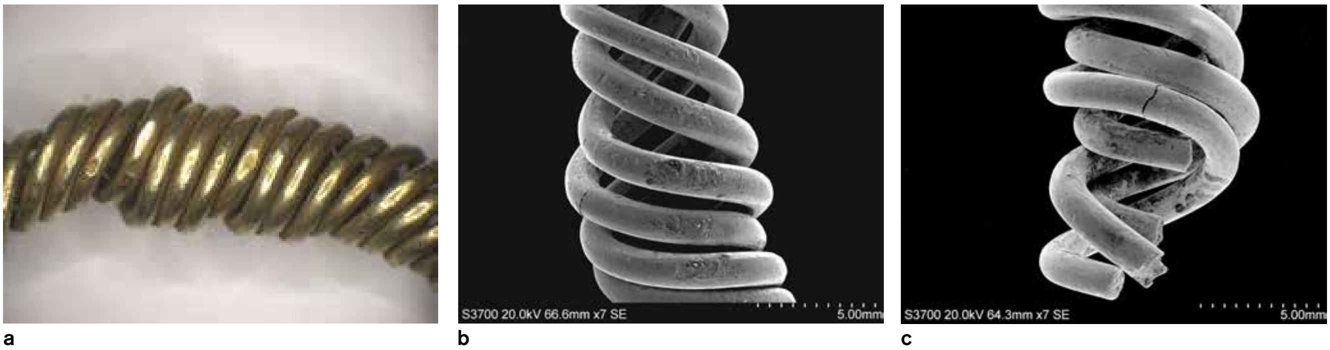


Figure 17.27a–c a) Torc/bracelet fragment F.88; SEM SE images of b) a slightly opened region showing its four coiled wires and c) the cracked and broken end

431–2). The torc is a pale gold-coloured, tightly coiled small diameter torc neck-ring or bracelet body section. It is fragmentary and appears to have been deliberately over-twisted, deformed and broken. It comprises four wires about 1.5mm thick and is similar to other small torcs.

A polished cross-section shows its extremely thick surface-enriched layer (up to 0.4mm), almost half the overall wire thickness (three quarters of the wire volume) (**Fig. 17.28**). This is in complete contrast to torc/bracelet F.160, which is of relatively similar core composition but with much thinner surface enrichment (**Table 17.4**; **Fig. 17.26**).

The core microstructure of the wires of F.88 is an extremely fine two-phase structure with a composition of 51.7 wt% Au, 42.4 wt% Ag, 5.9 wt% Cu, while the thick surface has lost around half of the silver as well as most of the copper (79.0 wt% Au, 20.7 wt% Ag, 0.3 wt% Cu) (**Table 17.4**). This is the thickest enrichment layer of any wire examined by far; the loss of around half of the silver in the enriched region suggests a potential enrichment process (La Niece 1995), beyond the simple removal of oxidised copper from the surface during wire manufacture. As argued above in the case of gold sheet, the microstructure of the enriched

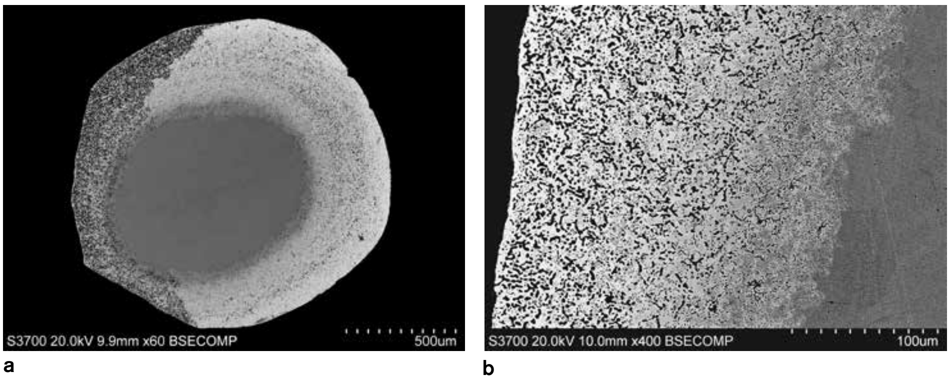
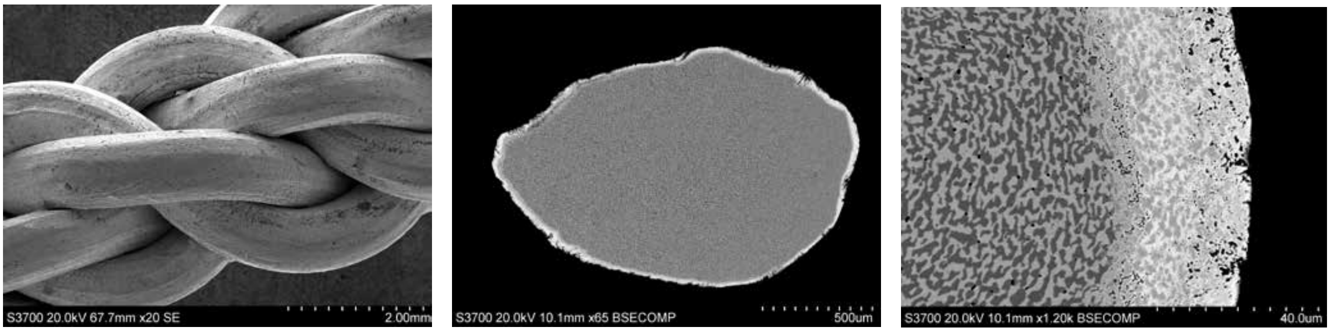
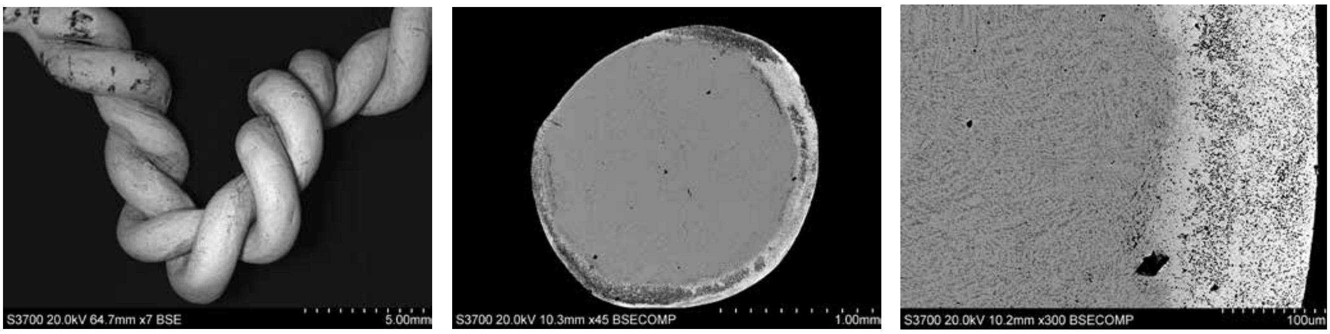


Figure 17.28a–b SEM BSE images of a) the extremely thick surface enrichment of torc/bracelet wire F.88 showing heavy wear as flat spots with corrosion penetrating these areas where the original protective burnished surface gold is missing, and b) of the thick gold-enriched surface with porosity, where the copper-rich phase has been depleted



a b c

Figure 17.29a–c a) SEM SE image of torc F.116 plied wires with linear facets; b) SEM BSE image of the wire cross-section, showing the darker core and the brighter surface layer and the irregular profile of the wire due to hammered facets and wear; c) SEM BSE image of the two-phase core alloy with dark-grey copper-rich phases and medium-grey silver-rich phases (left) and of the thick bright gold-enriched layer (right)



a b c

Figure 17.30a–c SEM BSE images of a) the torc/bracelet fragment F.135 plied wires; b) the medium-grey core alloy and the bright thick gold-enriched surface layer, showing variable corrosion within it and extensive wear through use (left of wire); c) the medium grey two-phase core alloy rich in copper and silver and the bright thick gold-enriched surface layer

layer, and in particular the porosity in the corroded region, is much like that of refined gold samples and material treated by salt parting (cementation) (Ramage and Craddock 2000, chapters 5, 9, 10). This type of process could also explain the thickness of the enriched zone in this case. In addition, such a salt parting process could have been carried out on a thick alloy rod *before* proceeding with the sequence of hammering to make the thin, elongated wire. A longer period of high-temperature chemical reactions would allow deeper penetration of the surface by leaching agents, leaving the metal porous for further reaction, compared with the hammering, annealing and pickling cycles, which would essentially compress and seal the porous surface during wire elongation, thus retarding or slowing further enrichment during these cycles (see p. 436).

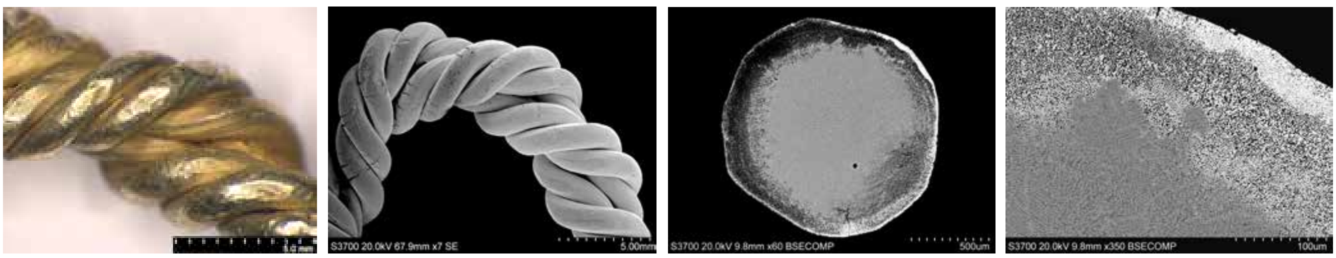
Silver-gold-copper alloy wires

By comparison with the high gold-silver with low copper alloy wires, the majority of the sampled Snettisham wires are lower in gold (mean value of 24 wt% Au, see **Table 17.5**) and have a two-phase microstructure, which appears mottled light-grey and mid-grey on SEM BSE micrographs (**Figs 17.29–30**). These two-phase core alloys are essentially the result of the dominant silver-copper eutectic microstructure in which the light-grey phase of the SEM BSE images (e.g. **Fig. 17.29c**) is silver-rich while the dark-grey phase is copper-rich (**Tables 17.5–6**). Gold appears in solid solution in both phases, but is distributed non-uniformly between the two; there is more gold in the copper-rich phase than in the silver-rich one.

A most important feature of these lower-gold wires is that they typically show a thicker compacted enriched surface layer compared to the higher gold alloys. This is simply the result of the relative ease with which the deeper interconnecting honeycomb copper is accessible to oxidation during annealing and removal by pickling, and hence the development of thicker surface enrichment. This thickness is also an indicator of the large number of hammering/

Figure 17.31a–d a) Wire torc/bracelet F.156; b) SEM SE image of the plied 1.4mm-thick wires showing extensive stress corrosion cracks; c) and d) SEM BSE images of the cross-section showing the severe corrosion of the copper-rich phase of the core below the intact enriched surface layer. Note the residual dendritic core microstructure at high magnification

a b c d



		Bulk composition (wt%)			Surface composition (wt%)		
Cat. no. BM reg. no.	**Polished sample no.**	**Au**	**Ag**	**Cu**	**Au**	**Ag**	**Cu**
F.153 1991,0407.44.a	J1516	30.2	49.6	20.2	58.6	39.7	1.7
F.5f 1991,0501.58	J1514	26.2	46.6	27.2	26.8	67.7	5.9
F.93 1991,0501.83	J1510	20.5	53.2	26.3	33.6	64.1	2.3
F.97 1991,0501.85	J1511	12.2	52.8	35.0	31.3	67.8	0.9
F.156 1991,0501.87	J1520	29.1	53.2	17.7	63.1	35.2	1.7
F.9d 1991,0501.128	J1496	26.3	50.9	22.8	43.3	53.3	3.4
F.11a 1991,0501.133	J1497	21.3	64.4	32.3	30.3	64.1	5.6
F.154 1991,0501.144	J1499	23.8	49.3	26.9	38.8	58.5	2.7
F.116 1991,0501.145	J1500	18.5	45.5	36.0	32.5	64.0	3.5
F.108 1991,0501.154	J1490	39.6	46.8	13.6	66.7	32.6	0.7
F.429 1991,0501.156	J1489	29.5	45.2	25.3	49.3	47.9	2.8
F.84 1991,0501.158	J1492	24.2	57.1	18.7	36.3	62.4	1.3
F.158 1991,0501.191	J1537	29.7	52.5	17.8	64.7	34.2	1.1
F.159 1991,0501.193	J1535	10.8	45.3	43.9	24.8	71.4	3.8
F.21b 1991,0501.207	J1531	20.4	43.5	36.1	45.0	52.0	3.0
F.147 1991,0501.221	J1527	16.4	51.0	32.6	35.2	58.0	6.8
F.135 1991,0501.222	J1526	27.2	58.4	14.4	48.1	47.3	4.6
S.32; S.37 1991,0407.50; 1992,1203.1	J1710 J1711	30.9	45.6	23.5	63.7 mean max 87.0	35.1	1.2
mean		24.2	50.6	26.1	44.0	53.1	2.9
min		10.8	43.5	13.6	24.8	32.6	0.7
max		39.6	64.4	43.9	66.7	71.4	6.8

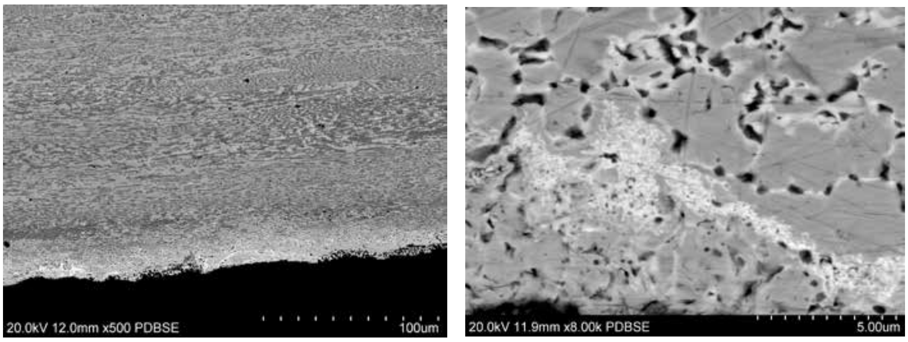
Table 17.5 SEM-EDX analyses of silver-gold-copper alloys (18 wire samples). Representative area analyses of the bulk compositions and enriched surfaces in polished cross-sections. Compositional data plotted on Au/Ag/Cu ternary diagrams in Fig. 17.46

annealing/pickling cycles such wires have gone through. The thickness varies from several microns to over 100 microns. While many wires show a fairly solid metal interface between the thick surface layer and the core (**Fig. 17.29**), others have a corroded layer of variable thickness at the interface, where the copper-rich phase has preferentially been leached away during burial (**Figs 17.30–1**). The integrity of the structure is nonetheless maintained by the continuity of the uncorroded silver-rich phase network from the core to the enriched surface layer.

The thick wire torc S.31-9 has a very thin golden surface layer (up to *c.* 87 wt% Au) and the fractured ends of the core are pink-coppery coloured from corrosion of the copper phase of the core (*c.* 24 wt% Cu) (**Fig. 17.32**). Thus, this thickest faceted torc wire has the same overall microstructure, composition and enriched surface as the other thinner wire torcs, suggesting the same processes were used to make this one too.

High-copper and low-gold silver alloy wires

High-copper and low-gold silver alloy wires are generally more brittle than the high gold ones; they display severe stress corrosion cracks on their surface and large fractures from twisting and wear (**Fig. 17.33a**), as well as flaking of



a b

Figure 17.32a–b SEM BSE images of torc fragment from S.31–S.39 in polished cross-section: a) two-phase eutectic core and the diffuse surface enrichment on this thick wire; b) brighter fine very high-gold (87 wt% Au) grain boundary regions within the overall enriched surface layer

the enriched surface from the severely corroded core (**Fig. 17.33b** and also see the reel torc F.120 on p. 443). Sample F.89 was so friable that the surface had flaked and was even missing from the sampled section.

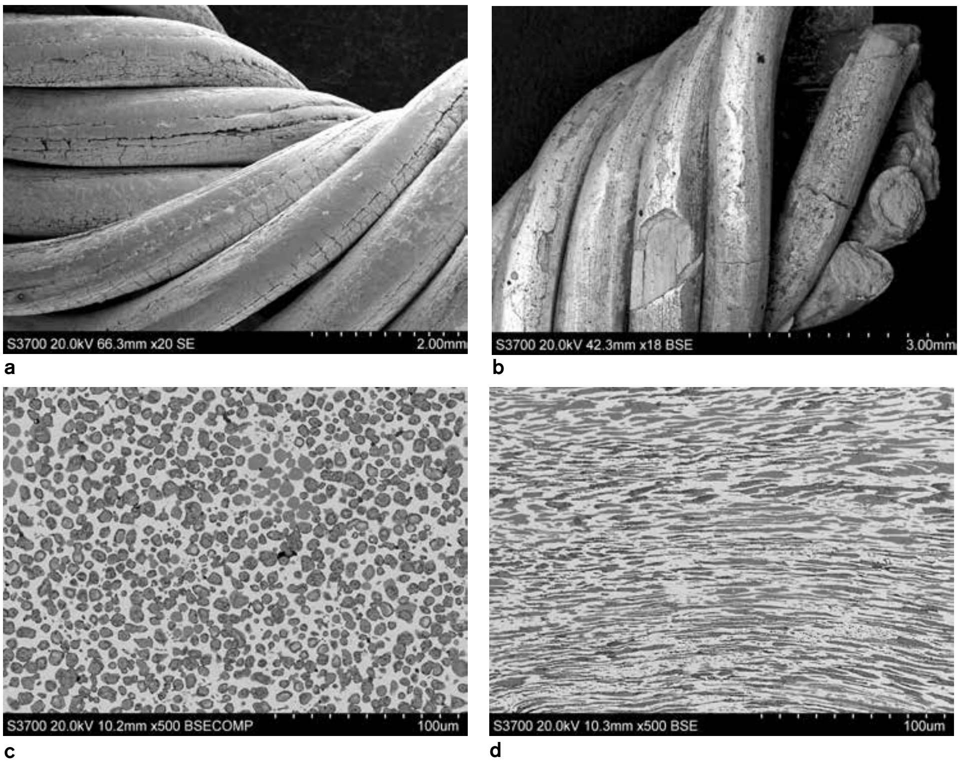
The cross-sections of eight such wires show that they are made of a two-phase core alloy rich in silver and copper and poor in gold (**Fig. 17.33c**). Their core composition ranges between 34 and 71 wt% for silver, 21 and 55 wt% for copper and very variable gold between 0.4 and 10 wt% (**Table 17.6**). The wire surfaces, on the other hand, contain more silver and gold, up to 92 wt% Ag and rather variable gold up to 22 wt% Au, and much reduced copper (between 1.3 and 9 wt% Cu). From these results, it appears that silver-copper wires were produced in a similar way to the gold-rich wires, through repeated cycles of hammering, annealing and pickling in acid. The surfaces of the wires have been enriched in precious metals, giving them a silvery colour. In these cases, the copper-rich phase has been largely removed and the porosity left behind was compressed by subsequent hammering (**Fig. 17.33d**).

Essentially, these results show that all of the gold-silver-copper alloy wires have a significant amount of surface enrichment, which gave the wires, and hence the torcs, a lighter, brighter and more golden appearance (depending on the alloy) after manufacture, compared to the basic starting alloys used to make them.

Bronze wires

In the Catalogue (Chapter 14), the broad term 'copper alloy' is used for those objects clearly exhibiting a greenish corrosion patina. In this Science Chapter, analysis shows that the sampled wires were of bronze (i.e. an alloy of copper and tin). Hence the projection that the vast majority, if not all of the green corroded Snettisham objects described as 'copper alloy' are also bronze. Essentially the Snettisham material predates the appearance of brass (i.e. an alloy of copper and zinc) in the Roman Period (Montero-Ruis and Perea 2007: Craddock *et al.* 2004).

There are only a few complete bronze torcs, such as L.6 (**Fig. 17.34**), although there are a large number of bronze torc wire fragments, with many being generally from smaller and thinner torcs than the range observed for gold and silver alloys. Many of the small, thin bronze wire torcs are in a heavily corroded state with much green copper corrosion on their surfaces, yet some are still smooth with bronze-coloured surfaces (**Fig. 17.35**). The workmanship in terms of consistent wire size and uniformly tight twisting of these torcs is similar to those of gold alloys.



a b c d

Figure 17.33a–d a) SEM SE image of the brittle and damaged coiled silver alloy wires with multiple stress corrosion cracks from torc F.102; SEM BSE images of b) the surface and broken ends of torc F.99 wires, showing the clear difference between the solid core and the corroded 'skin', which is flaking away; c) the transverse cross-section of a silver alloy wire from torc F.99, showing the two-phase core with a light-grey silver-rich phase and a dark-grey, partially corroded, copper-rich phase; d) the longitudinal section of a silver alloy wire from torc/bracelet F.89, showing the flattened, extended microstructure resulting from the hammering process

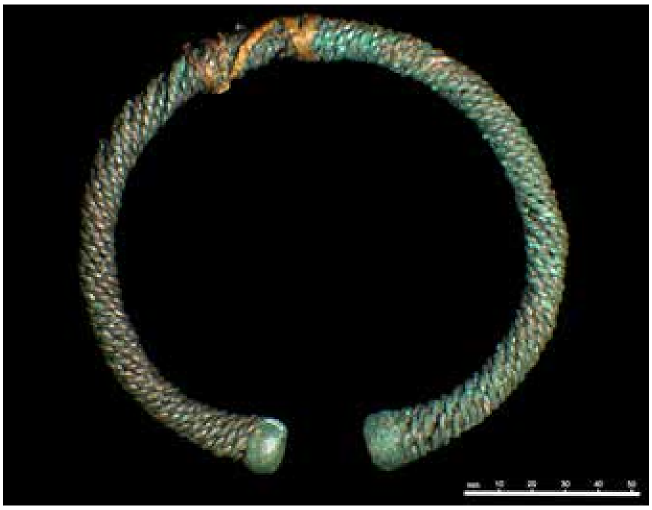


Figure 17.34 Bronze torc L.6, showing its heavily corroded surface and fibrous string wrapping (scale 50mm)

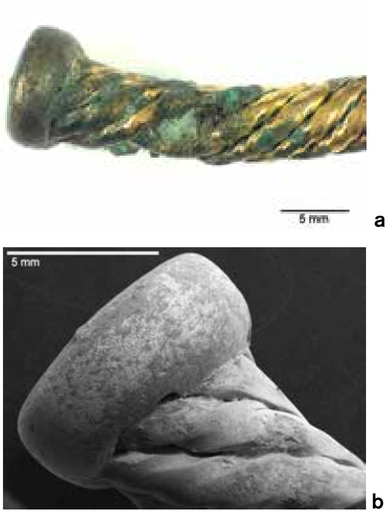


Figure 17.35a–b a) Torc F.168 with bronze wire surface exposed and only limited corrosion compared to many extensively corroded similar-sized torcs. Note the extreme wear on the wires; b) SEM BSE detail of torc F.168 showing the dendritic structure on the cast-on terminal surface

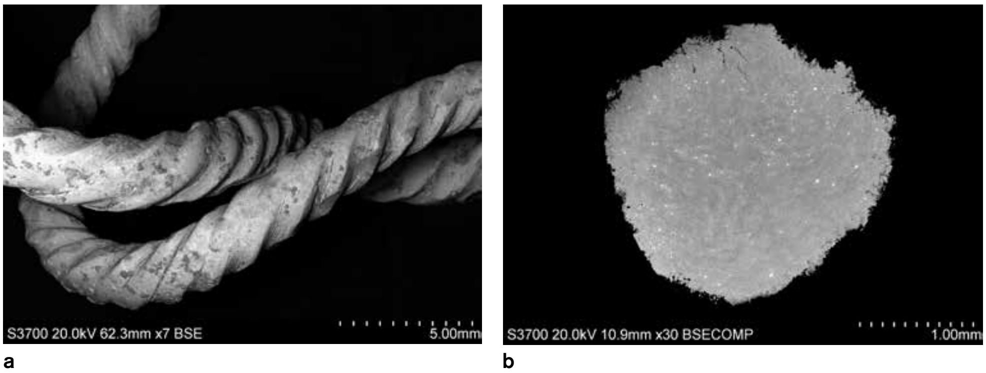
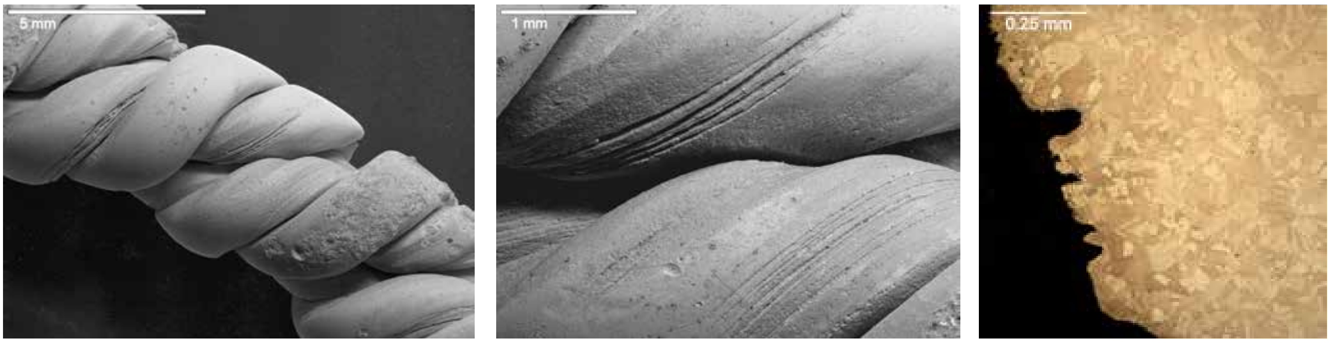


Figure 17.36a–b Bronze wire fragment F.14b. SEM BSE images of a) twisted square-section wire, which gives it a decorative 'spiral' appearance, and b) cross-section showing residual coring and sparse distribution of lead inclusions (white dots). The surface is uneven and pitted through corrosion, but the core remains uncorroded

Only a limited number of bronze wires from The British Museum Snettisham objects were sampled for metallography and analysis, because a further 82 similar bronze samples from the Norwich Castle Museum's Snettisham collection (plus a number of gold/silver alloys samples) were analysed independently by Stone (1987) (Ch. 18). The bronze alloys are typically low-tin bronze with small quantities of lead, nickel and/or arsenic (e.g. F.14b: 86 wt% Cu, 13 wt% Sn, 0.2 wt% Pb, 0.2 wt% Ni and 0.6 wt% As) and appear to be quite free of inclusions. Corrosion attacks quite deeply on the surface of this wire but the core remains uncorroded (**Fig. 17.36**).

Etched bronze cross-sections show annealed equiaxed grain structures, indicating that the hammered wires were most likely fully annealed to release the internal stress and crystalline deformation within the metal and hence soften it before the final coiling/plying. This was achieved in order to facilitate and maintain the tightly twisted final shape and prevent the torcs from springing open. Some areas have strained grains from the final twisting (**Fig. 17.37**). The addition of terminals by casting-on (see below, p. 458) would have provided heat to further anneal the metal.

Figure 17.37a–c Bronze torc/bracelet fragment F.361. Etched metallurgical polished cross-section under optical illumination showing the equiaxed grain structures, which form during recrystallisation of the bronze while heated during annealing, which releases the trapped stress from plastic deformation of the hammered and twisted wires (Bozzolo and Bernacki 2020). Note the parallel bands/lines within grains are annealed 'twinned' grain boundaries, some of which are deformed by the final mechanical deformation (twisting). Note the very deep channels on the wires in this are caused by the folding of the corners of the square-section wire during hammering. These are not the same as the parallel grooves discussed on the same bronze wire and shown in Figure 17.38



a b c

Figure 17.38a–c Bronze torc/bracelet fragment F.361. a, b) SEM BSE images showing the deep parallel score marks along the wire surfaces; c) Photomicrograph of the polished and etched cross-section of these deep score marks in the wire surface

Mercury gilding was observed on a number of bronze wires, and this is considered on p. 450.

Wire case study: Torc F.119–20

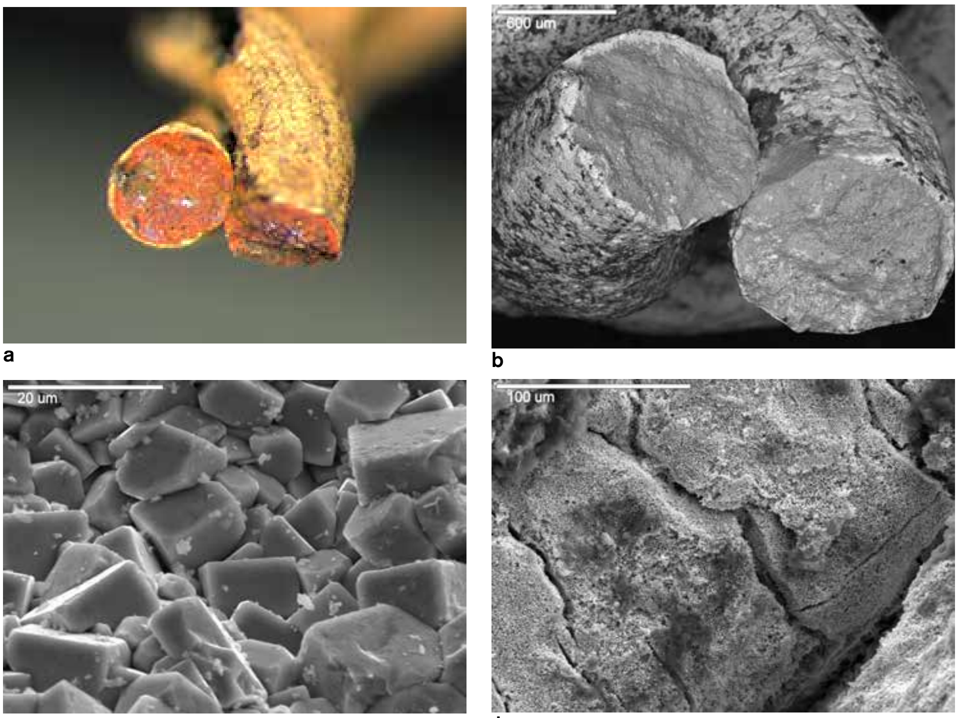
Of all the wires and torcs examined, the reel terminal torc F.119–20 exhibits most, if not all, of the characteristics of wire technology, metallography, composition, surface enrichment and corrosion that exemplify the Snettisham wire-based torc collections (**Fig. 17.39**). Hence, the detailed study of this torc provided optimal parameters for surface observation and sampling for full optical investigation and SEM-EDX analysis of the material.

The composition of the wires falls into the category of high-copper and low-gold silver alloys (p. 440, **Table 17.6**). The surface colour of the torc wires is light brown/golden and the original ancient fractured ends of the wire are bright red with cuprite corrosion and a golden rim (**Fig. 17.40a**). Examination in the SEM shows the wire surface to be in very poor condition: it is highly porous and deeply cracked circumferentially (**Fig. 17.40b–d**).

The polished cross-section of the wires shows a pink-coloured (copper-rich) uncorroded core metal, surrounded by a dark corrosion layer, and on the surface a thick silvery-golden layer (**Fig. 17.41a**). The SEM BSE images (**Fig. 17.41b–d**) show a homogeneous two-phase eutectic core alloy and a compressed thick surface-enriched layer, in which the silver and gold are doubled in concentration while the copper has depleted to one sixth of the core alloy value (**Table 17.7**).

It is interesting to note that the heavily hammered and elongated wire (**Fig. 17.41b–d**) shows no evidence of

Figure 17.39 Reel terminal torc fragment F.120



a b c d

Figure 17.40a–d a) Optical micrograph of the ancient broken ends of the wires of reel terminal torc F.120 showing the bright red cuprite (copper oxide) crystals and the golden-coloured metallic surface; b) SEM BSE image of the same wires, which are about 1.2mm thick; c) SEM SE image at high magnification showing the cubic cuprite crystals; d) SEM SE image of the surface of the wire showing the fine porous surface and the deep tangential stress corrosion cracks into the metal

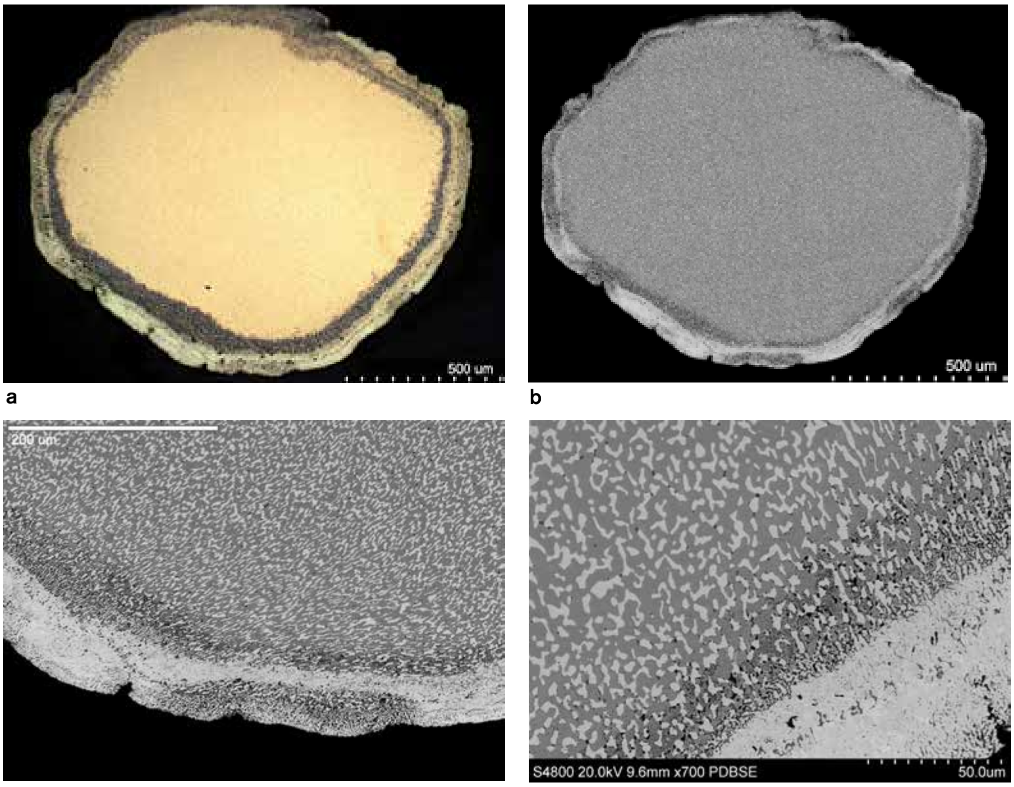


Figure 17.41a–d Reel terminal torc F.120. The optical polished cross-section of the wires (a) shows a pink-coloured (copper-rich) core metal, surrounded by a dark corrosion layer, and on the surface a thick, lighter silvery-golden layer (*c.* 70 microns thick). The flattened sides are facets from hammering. SEM BSE images (b–d) show a homogeneous two-phase core alloy and the compressed surface-enriched layer, *c.* 60 microns thick. The wire is around 1.2mm in cross-section

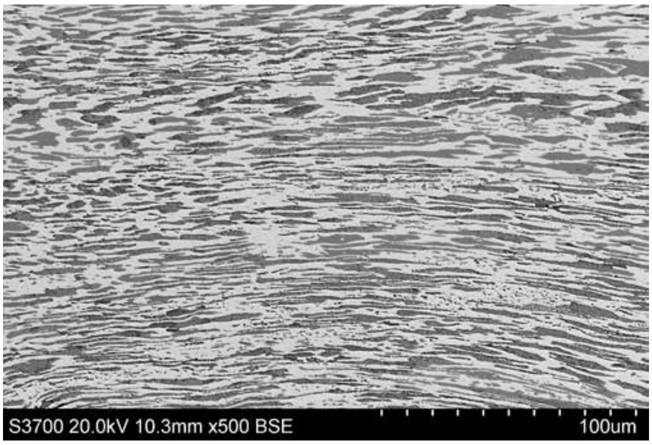


Figure 17.42 SEM BSE image of the longitudinal section of silver-copper-rich wire F.89, which has a similar core microstructure to F.120, showing the extreme phase elongation from deformation in the wire during hammering to lengthen it and reduce the diameter

deformation of the two-phase eutectic alloy core when seen in transverse section because the microstructure is uniformly compressed circumferentially during this process of hammering to elongate the wire and reduce its diameter. In contrast the longitudinal section microstructure shows extreme mechanical elongation of the two-phase core alloy, because the wire lengthens and the two phases are stretched linearly during hammering (**Fig. 17.42** shows this elongation in a similar torc wire).

SEM-EDX elemental mapping for gold, silver and copper of the neck-ring wires clearly shows that gold and silver are enriched in the surface layer and are uniformly distributed at lower levels in the core, while copper is very depleted in the surface layer and uniformly distributed at a high level in the core (**Figs 17.43–4**). There is a very clear boundary in the composition between the core and surface layer, with a corrosion layer in between. Oxygen shows its highest concentration where copper has oxidised (**Fig. 17.44e**), just below the gold/silver-enriched layer. This oxidation of copper took place during annealing at an elevated temperature (e.g. *c.* 550 °C, dull red heat). The two-phase microstructure and enriched surface layer of this wire (**Fig. 17.44** and at higher magnification in **Fig. 17.44**) is common to many of the silver wires with a high-copper and low-gold core composition (**Tables 17.6–7**). Gold is distributed throughout the core in both the silver-rich and copper-rich phases, but more gold is associated with the copper than with the silver. This was determined by the microanalysis of the different phases in the core (**Table 17.7** spectra 7 and 8) and observation of the changes in composition within the thick surface-enriched zone (**Fig. 17.45** and corresponding **Table 17.7**).

As discussed on pp. 435–6, the surface-enriched layer forms during an important part of the wire-making process, in which annealing the work-hardened wire (typically at *c.* 550–650 °C) causes the surface copper phase to become oxidised by heat, leaving black copper oxide on the wire surface. This copper oxide is then removed by pickling, leaving only gold and silver from the original copper-rich phase on the surface. Subsequent hammering to extend the wire further reduces the surface porosity left by the removal of the copper. It is this simple process that is key to the formation of enrichment in precious metal at the surface of the Snettisham wire work.

The following section brings together scientific discussions on alloy composition, surface treatments and colour for the material from Snettisham, combining the analyses of gold sheet and wires discussed in sections 17.3 and 17.4.

17.5 Alloy compositions, surface treatments and colours

This section covers the Snettisham sampled gold/silver alloy objects in the British Museum collections, bringing together

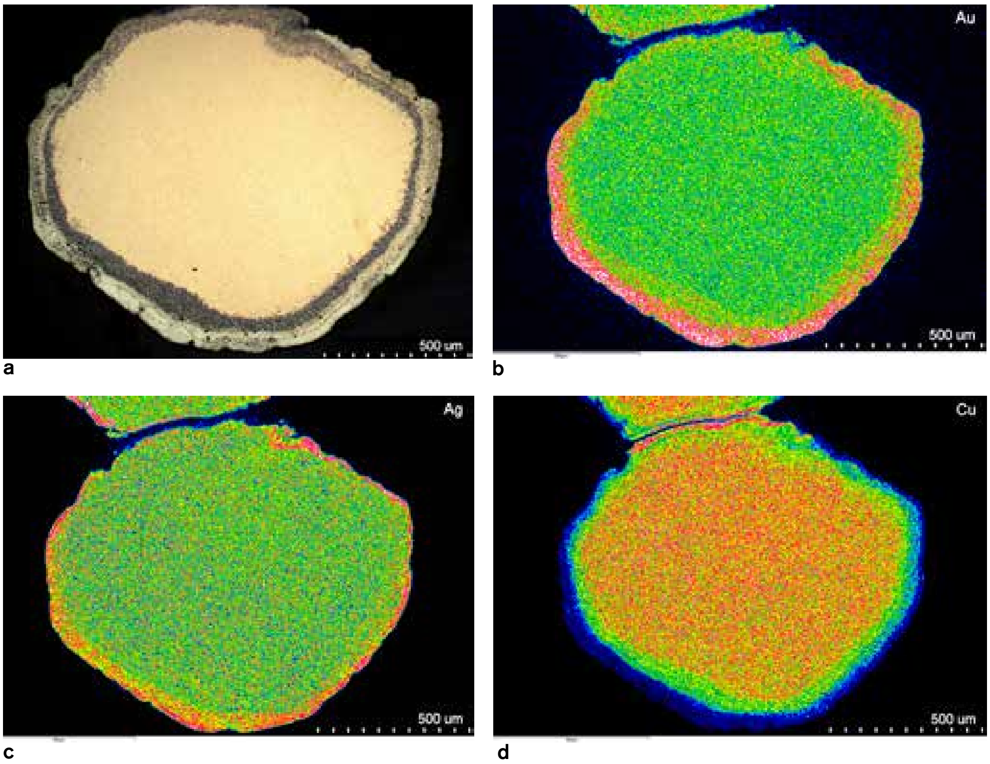


Figure 17.43a–d a) Optical metallographic image of the polished section of torc F.120 wire, showing the coppery-coloured core, the pale silver/gold surface layer, and a dark corrosion layer between. Elemental X-ray distribution maps for gold (b), silver (c) and copper (d) showing the copper-rich core and the gold/silver-enriched and copper-depleted surface. Core composition: Au 10.2 wt%, Ag 34.4 wt%, Cu 55.4 wt%; Surface layer composition: Au, 22.4 wt%, Ag 68.5 wt%, Cu, 9.2 wt% (Table 17.6)

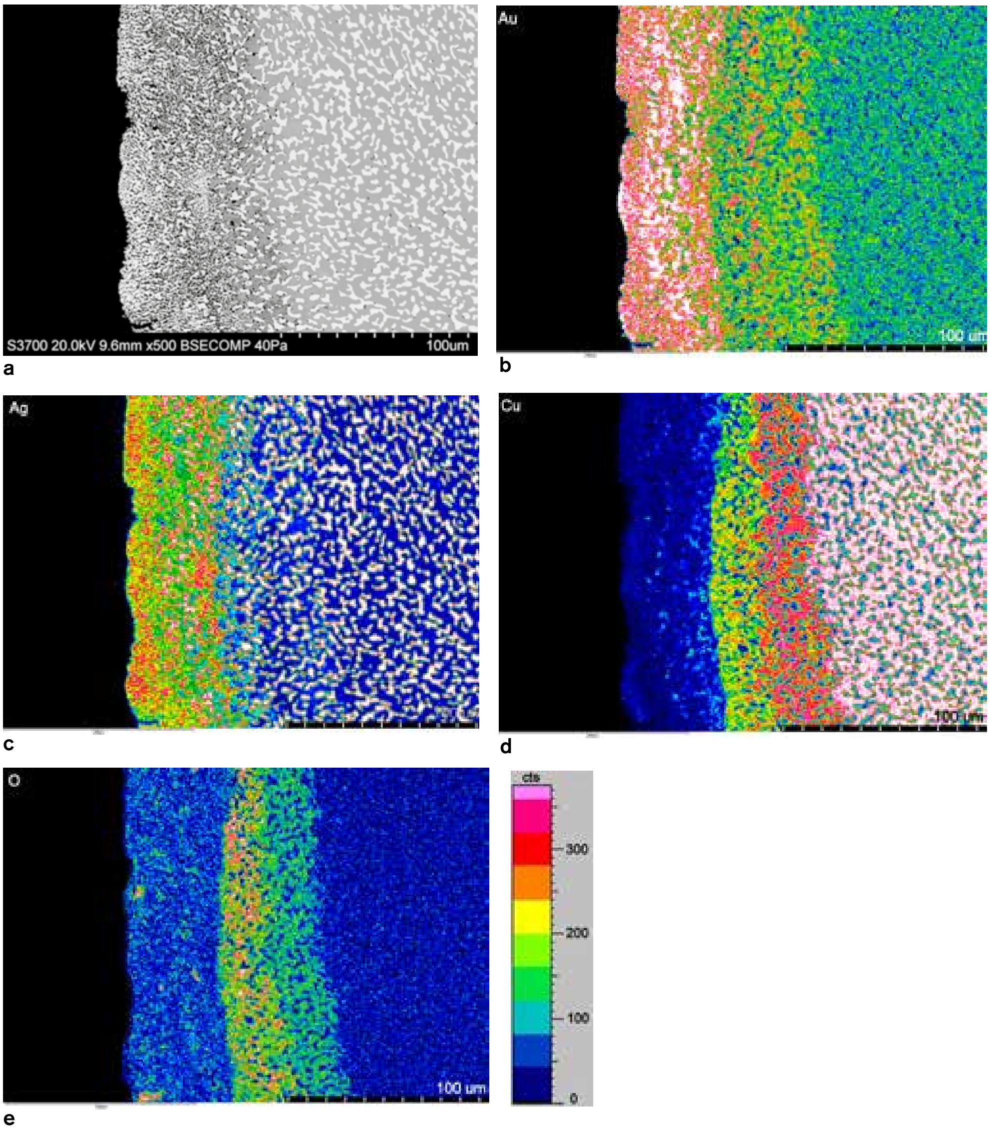
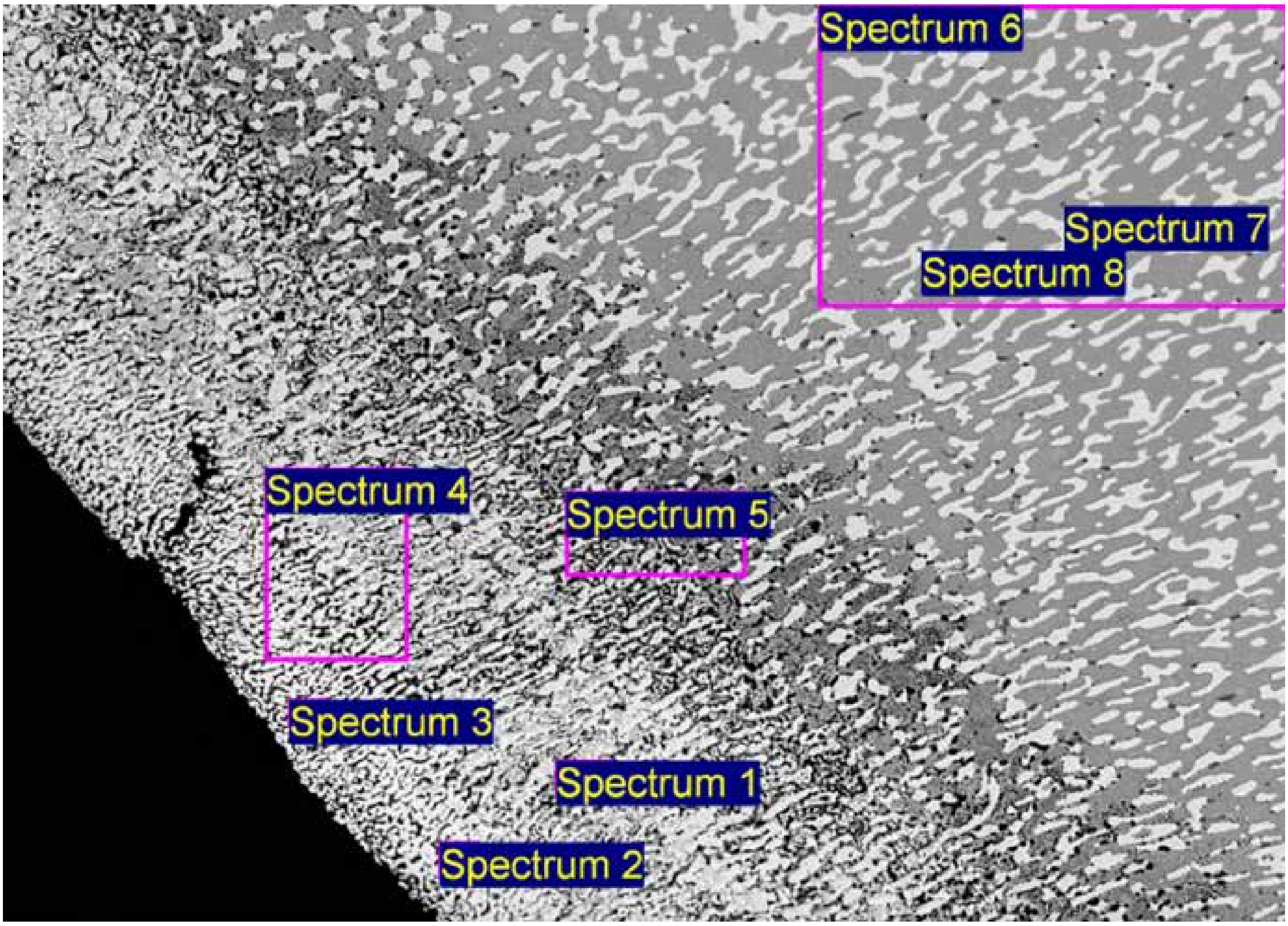


Figure 17.44a–e High magnification detail (x500, scale 100µm) of Fig. 17.44, showing a wire section from torc F.120: a) SEM BSE image showing the two-phase core microstructure to the right and the gold/silver-enriched surface layer to the left; elemental X-ray distribution maps of b) gold, c) silver, d) copper, and e) oxygen (image width *c.* 0.25mm). Colour scale shows relative element concentrations in each map

		Bulk composition (wt%)			Surface composition (wt%)		
Cat. no. BM reg. no.	**Polished sample no.**	**Au**	**Ag**	**Cu**	**Au**	**Ag**	**Cu**
F.120 1991,0501.80	J1460	10.2	34.4	55.4	22.4	68.5	9.2
F.148 1991,0501.86	J1512	8.5	70.7	20.8	11.9	86.8	1.3
F.89 1991,0501.101	J1524	5.7	58.4	35.9	no surface enrichment observed – flaked surface		
F.99 1991,0501.137	J1498	8.5	51.8	39.7	3.6	90.2	6.2
F.22a 1991,0501.148	J1488	8.1	67.4	24.5	14.2	83.0	2.8
F.102 1991,0501.187	J1538	6.8	44.2	49.0	12.7	80.4	6.9
F.103 1991,0501.215	J1530	6.5	48.7	44.8	4.5	88.8	6.7
F.380 1991,0501.218	J1528	0.4	57.7	41.9	0.8	91.8	7.4
mean		6.8	54.2	39.0	10.0	84.2	5.8
min		0.4	34.4	20.8	0.8	68.5	1.3
max		10.2	70.7	55.4	22.4	91.8	9.2

Table 17.6 SEM-EDX analyses of high-copper and low-gold silver alloys (8 wire samples). Representative area analyses of the bulk compositions and enriched surfaces on polished sections. Compositional data plotted on Au/Ag/Cu ternary diagrams in Fig. 17.46

Figure 17.45 SEM BSE image of torc F.120 wire, showing the areas and points of analyses from Table 17.7 (image width *c*. 0.25mm)



Spectrum	Polished section area	Cu %	Ag %	Au %
Spectrum 1	Enriched layer, small area	11.5	64.4	24.1
Spectrum 2	Enriched layer, small area	7.1	72.4	20.5
Spectrum 3	Enriched layer, small area	8.8	71.3	19.9
Spectrum 4	Enriched layer, larger area	9.2	65.9	24.9
Mean	Enriched layer	9.2	68.5	22.3
Spectrum 5	Corroded zone	42.2	43.0	14.8
Spectrum 6	Uncorroded core area	55.0	34.6	10.4
Spectrum 7	Copper-rich phase core	76.0	11.7	12.3
Spectrum 8	Silver-rich phase core	14.4	80.0	5.6

Table 17.7 SEM-EDX microanalyses of key areas of the polished cross-section from torc F.120 wire shown in Fig. 17.45

the discussions of gold sheet and wires in sections 17.3 and 17.4. It complements the analysis of the 82 bronze objects from Snettisham Hoards A, B and C in the collections of Norwich Castle Museum (see Ch. 18).

Alloy compositions

The core alloy compositions of all the sampled wires and sheet fragments (components from multi-strand and tubular torcs) are plotted in **Figure 17.46a**. This diagram emphasises in particular the grouping of the copper/silver-rich wires (p. 448) (< 50 wt% Au, **Tables 17.5–6** and **Fig. 17.46a** lower centre right), which include the silver-gold-copper alloys and high-copper and low-gold silver alloys, and the alignment of the gold-rich wires and sheets (> 50 wt% Au, **Tables 17.2, 17.4**) along the gold-silver axis (**Fig. 17.46a**, upper right). The surface analyses (in cross-section) of the same samples are plotted in **Figure 17.46b**. All the copper-rich core analyses now move to the right and align near the gold-silver axis. The comparison between the two diagrams shows a severe loss in copper from the surface layer of the copper-silver eutectic alloys, thus resulting in surfaces enriched in gold and silver. In contrast, most of the high gold-silver and low-copper wire alloys show only limited surface enrichment, in a similar way to the gold-rich sheet alloys.

Although objects from different Snettisham hoards have been analysed separately due to their present-day division between museums, objects from Hoard F (at the British Museum) (**Figure 17.46a)** show the same alloy similarities and distribution to the gold/silver objects analysed from Hoards A, B and C (at Norwich Castle Museum. Stone, 1987 (see **Fig. 18.1**). This suggests the probability of a very close origin of manufacture, or certainly a very closely related goldsmithing tradition, across the material in these separate hoards. It is likely that it was all drawn from a similar circulation pool, at around the same time.

It is interesting to note that, in the uncorroded core metal, gold is associated more in the copper-rich phase of the silver-copper eutectic than with the silver-rich phase (**Table 17.7** spectra 7 and 8). This would account for the high-gold enrichment when the copper is depleted from the wire surface. Simultaneous enrichment in precious metals and depletion in base metal was most likely achieved through the combination of mechanical and chemical processes described above.

With the sheet and wire core alloy compositions plotted on the temperature isothermal contour diagram, the groupings clearly show the melting ranges of the alloys used by the metalsmiths for fabricating the torcs (**Fig. 17.47**). These vary between 780 °C and 870 °C for the lower-gold alloys, and 950 °C and 1050 °C for the gold-rich alloys, the latter including both sheet and wire (**Tables 17.2, 17.4**). Thus, the former cluster around the lowest melting range of the isothermal diagram, because of the incorporation of a significant amount of copper into the alloys of lower gold content. It must have been known to the metalsmiths that mixtures of gold, silver and copper in this range of proportions produced molten alloys more easily. They appear to have been deliberately exploiting the low-melting characteristics of these gold-silver-copper alloys that we can now see by way of the ternary phase diagram (cf. Lyman 1973). This might be one of the most important characteristics for the Iron Age craftspeople, allowing much easier and fuel-efficient use of resources in melting the alloys. Perhaps this was a very important practical consideration in the production process of the majority of these alloys. Knowing also that the final metal colour of the torcs would change during manufacture, the initial metal mix (with high copper) was not so important viewed from the perspective of the final achieved gold/silver colour of the artefact.

In summary, metallography and SEM-EDX examination have shown that four main precious metal alloys were used in the manufacture of the objects examined:

1. The highest average gold alloys, mainly seen in sheet objects (**Table 17.2**, p. 428).
2. High gold-silver and low copper alloys used in wires (**Table 17.4**, p. 437).
3. Silver-gold-copper alloys used in wires (**Table 17.5**, p. 440).
4. High-copper and low-gold silver alloys used in wires (**Table 17.6**, p. 446).

The latter two types comprise the majority of the wires sampled. The main metallurgical reason that alloys rich in gold were used for sheet objects is that they are malleable and therefore more easily hammered into thin sheet than the silver/copper-rich alloys which work-harden more quickly.

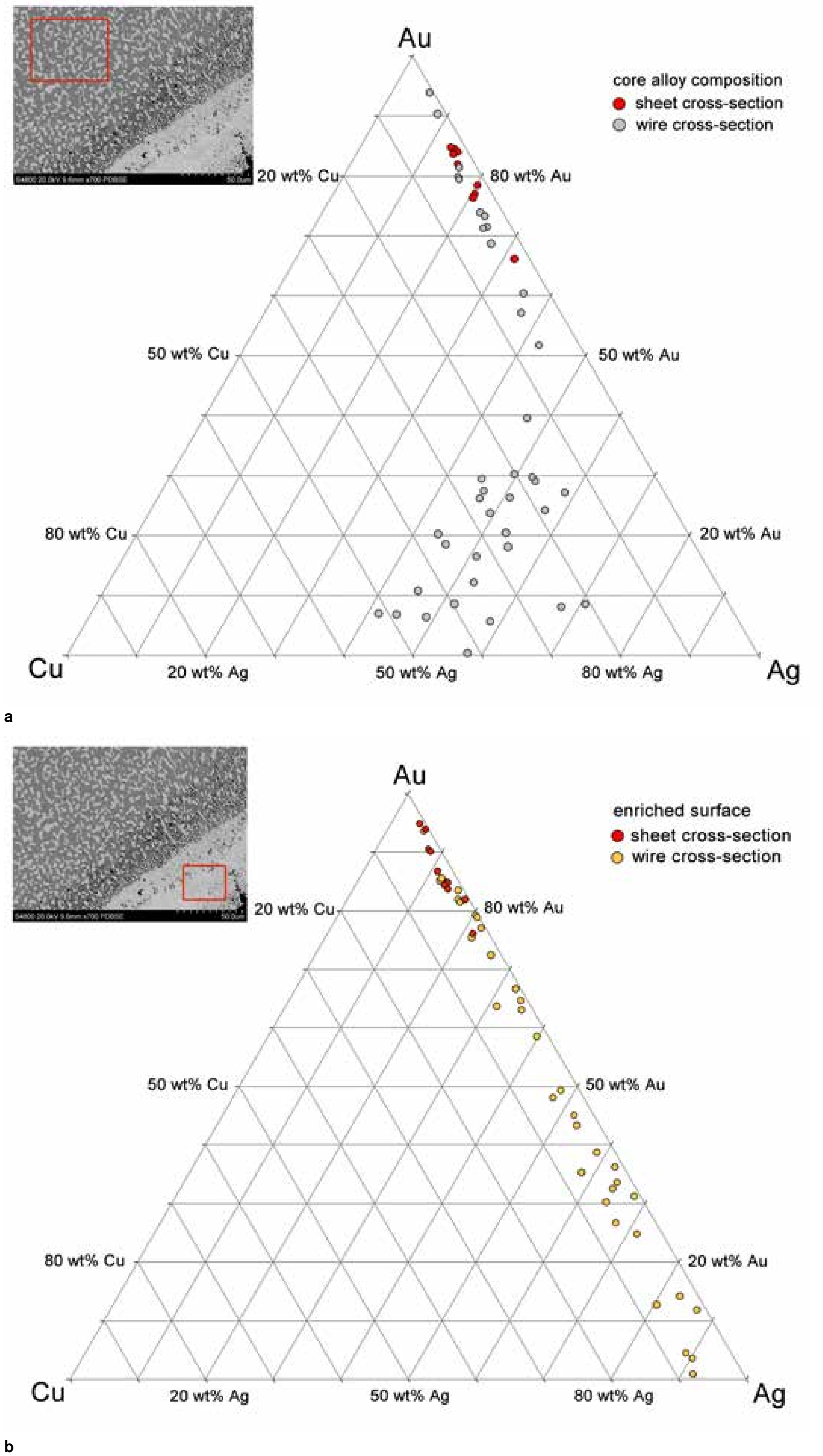
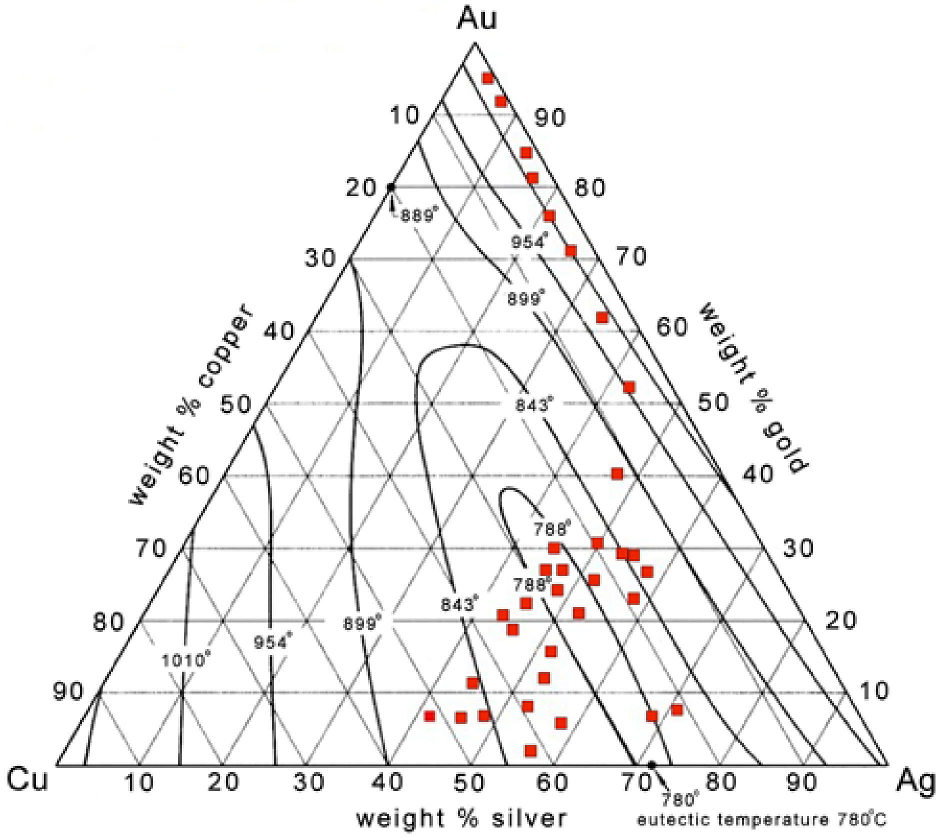
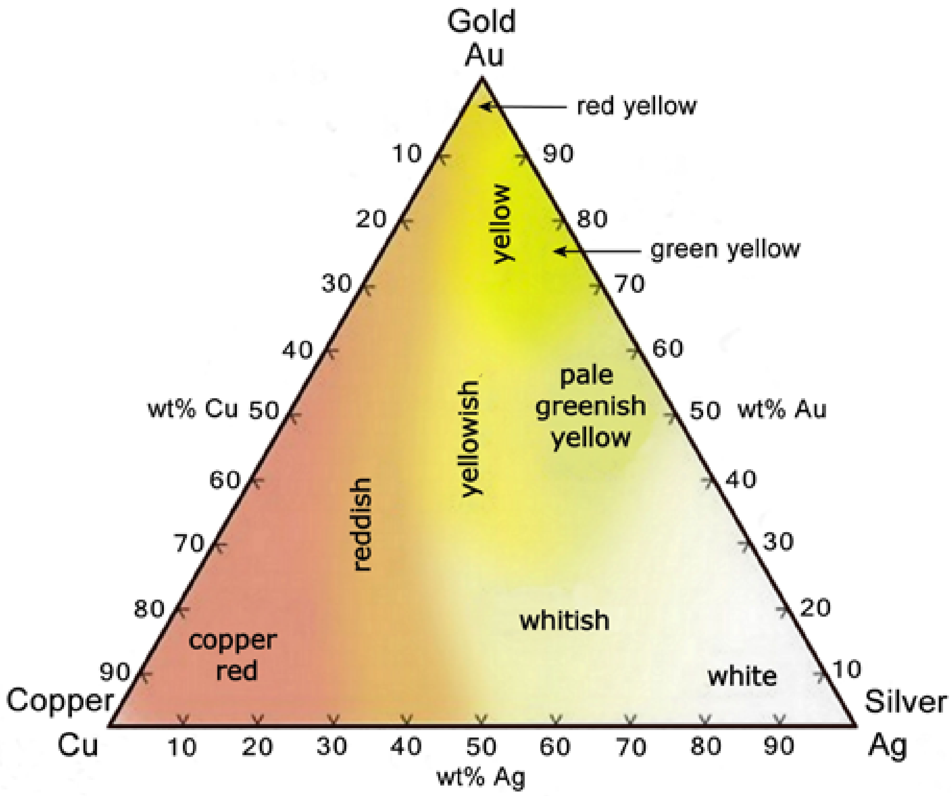


Figure 17.46a–b Gold-silver-copper ternary diagrams of a) the core compositions of 50 cross-sections showing the high gold-silver wires and sheet upper right, and the grouping of all the higher copper alloys lower centre; (b) the corresponding surface composition of the same samples. These clearly show the depletion in copper resulting in surfaces enriched in gold and silver for all of the copper-rich core samples. Inserted SEM BSE images are typical areas analysed in the core and surface layers



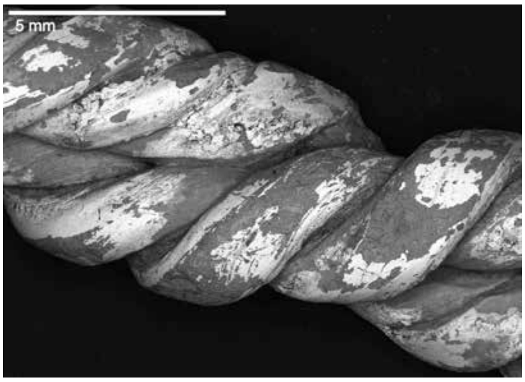
a



b

Figure 17.47a–b a) Plot of all the sampled core alloy compositions on the Au/Ag/Cu ternary diagram with isothermal contours of melting temperatures at 55 °C intervals for ternary gold, silver, copper alloys over the full range of temperatures from the lowest melting point at 780 °C (silver-copper eutectic) to that of solid gold (1064.4 °C), silver (961.9 °C) and copper (1084.5 °C) (Lyman 1973). Note the general clustering of the copper-rich wire alloys around the lowest melting temperature region (lower centre), in sharp contrast with the high-gold and low-copper sheet alloys, which all plot between the 1010 °C isotherm and upper gold/silver axis (upper right); b) Au/Ag/Cu ternary diagram indicating general colour zones of the alloys (modified after Cretu and Van der Lingen 1999) to compare with the plotted data from Snettisham in a). Note that the sheet core alloys are mostly in the yellow region, while the wire core alloys are in the paler yellowish/whitish regions, knowing that most are surface enriched and therefore moving towards the white/pale greenish yellow/yellow colour range (see Fig. 17.46)

a



b

Figure 17.48a–b a) Torc/bracelet F.182, with tightly plied pairs of gilded bronze wire; b) SEM BSE image of the outlined area in the optical image a). The mercury-gilded surface areas appear bright

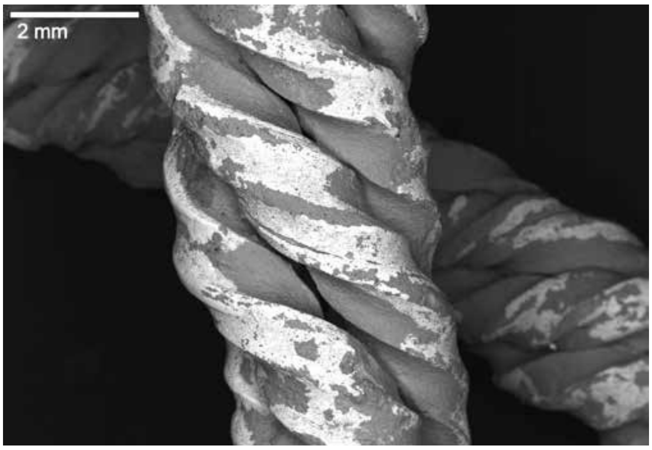


Figure 17.49 SEM BSE image of bronze torc/bracelet fragment F.15a, plied from gilded square-section individually twisted bronze wires. There is heavy wear between the adjacent wires from use of the torc

These latter alloys are quite suitable for wire making. The processes of hammering with frequent annealing and pickling that are necessary to make wires also leads to surface enrichment in gold and silver. The low-melting characteristics of these alloys make them easier to melt and cast.

Surface enrichment in gold and silver on the wires

Most low-gold alloy wires and many sheet fragments show some degree of surface enrichment of gold and silver, and in many cases substantial thickness in the compacted enriched surface layer has been found in the sectioned samples. Given the improvements in colour and corrosion resistance that surface enrichment bestows on the alloys, it is most likely that the effects of enrichment that occurs during wire making were not just noticed, but exploited by the metalsmiths. Many cultures see the colours of gold and silver as significant in their cultural expressions and were sought after. For example, many South American cultures used copper-rich alloys, not dissimilar to some of those found in the Snettisham objects, and certainly exploited the enrichment processes that they enhanced technologically to produce their desired golden colours (La Niece and Meeks 2000) (see section 17.4).

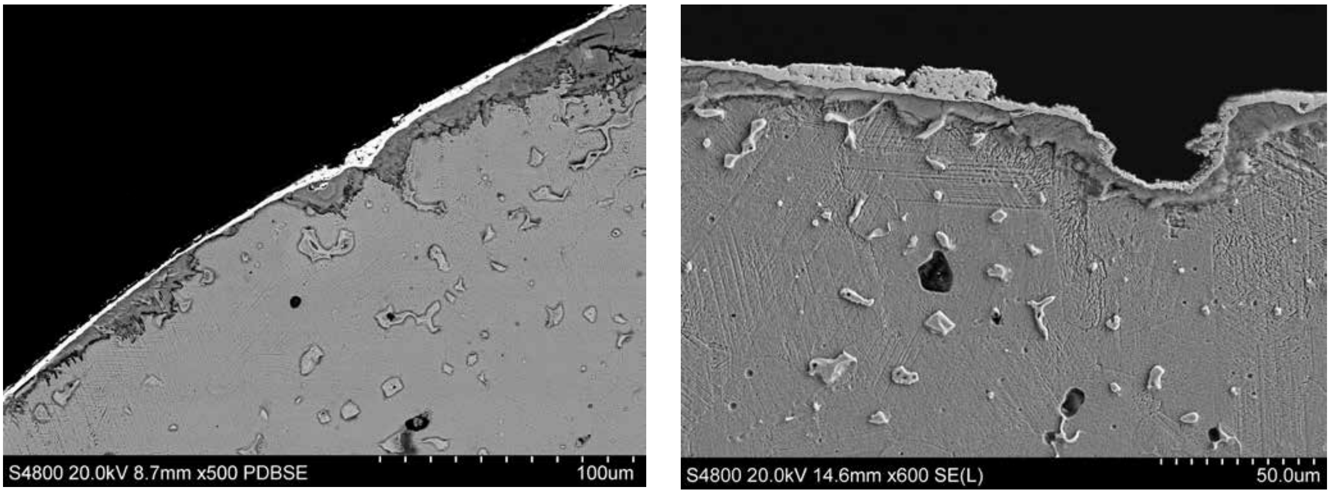
There are three major effects of the surface-enrichment process:

1. Significant saving in 'precious metals' used in the bulk starting alloys compared to the visual appearance of the finished torcs. The relative perceived values of different materials and alloys are discussed in more detail in Chapters 22 and 23.
2. The colour of the surface becomes more golden/silvery, which would be a desirable outcome. This occurs almost by default during wire production with the higher copper alloys, although the significant depletion in silver at the surface in some high-gold alloy objects would imply a deliberate and separate technological process along the lines of 'parting'. In both cases, the colour shift may have been part of an intended and controlled effect, since goldsmiths would have been well aware of the visual results of these processes and used them accordingly for the enhanced colour of these high-status objects. Colour is considered in more detail below (p. 452).
3. By removing copper from the surface, the metal is made more resistant to daily exposure to perspiration and staining during use. This is a very useful outcome, to preserve the quality and appearance of a torc, as anyone who has worn 'cheap' thin gold-plated jewellery and has had their skin stained green by copper corrosion will know.

Mercury-gilded wires

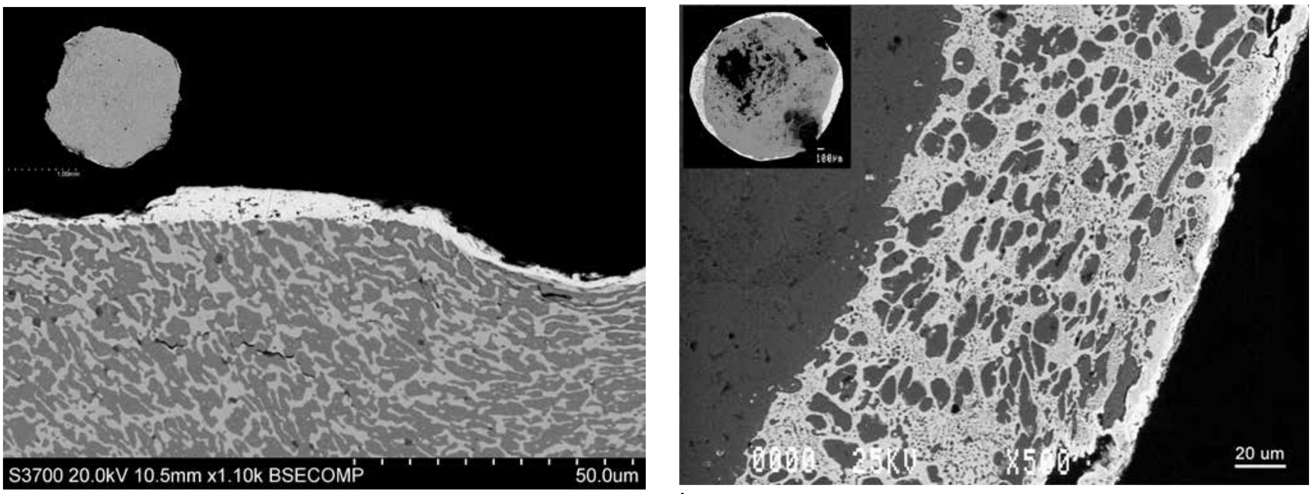
There are also some bronze wires with golden surfaces that have been deliberately gilded, probably by mercury gilding (also called fire gilding) based on the presence of low levels of mercury in the surface metal (**Figs 17.48–9**). Three different types of wires have been mercury gilded and are illustrated here. The gilding has in most cases been partly worn away during use or has been lost due to underlying corrosion of the bronze. The SEM images of the surface of the wires show the residual gilding as light areas while darker areas show the exposed bronze, where the gilding has worn away. Surface analysis by EDX shows the presence of significant low levels of mercury in the gold areas.

At higher magnification, the cross-section of torc/bracelet F.182 shows the typical structure associated with mercury gilding: a burnished and slightly porous gold layer of variable thickness. This layer contains a little, and variable, residual mercury (in this case it is around 12 wt% Hg), with a corroded layer in the bronze directly under the gilding, which also varies in thickness. The gilding follows the exact form of the wire surface, but it varies in thickness between 2 and 10 microns (**Fig. 17.50**).



a b

Figure 17.50a–b a) SEM BSE and b) SE images of the etched cross-section of mercury-gilded bronze wire from F.182, showing the continuous and thin mercury-gilded surface layer of variable thickness, following the contours of the underlying wire, with some corrosion of the bronze beneath. The particles in the bronze core are α+δ eutectoid intermetallic compound phase (Meeks 1993)



a b

Figure 17.51a–b a) SEM BSE image of a high-copper with low-gold silver alloy wire with mercury gilding (wire 2mm diameter, insert) (F.17b); b) SEM BSE image of a bronze wire from torc G.6 with a thick eutectic silver-copper layer underneath the thin surface gilding (wire 2mm diameter, insert)

It is hypothesised that gilding was achieved by rubbing a mercury amalgam (a paste-like mixture of liquid mercury with dissolved gold) onto the clean bronze surface (Lins and Oddy 1975). The complete object was then heated to above 357 °C to boil off the mercury leaving a porous gold layer on the surface. This porous layer would have then been compressed and given a shiny appearance by burnishing it. The thicker areas of gilding that are preserved still have the characteristic porosity, which resulted from the vaporisation of mercury (**Fig. 17.50b**). The gilding is closely bonded to the surface, which is now the underlying corrosion layer on the bronze that has been propagating down to a depth of around 10 microns during burial. In this case the gilding has largely protected the bronze from corrosion.

Two other types of metal from Snettisham in addition to bronze wire have been identified as having been mercury gilded: a high-copper with low-gold silver alloy wire (F.17b) and a bronze wire with an unusual complex multiple layer surface (G.6). The first is a typical example of mercury/fire gilding on a silver-copper alloy wire (42 wt% Ag, 51 wt% Cu, 7 wt% Au) (**Fig. 17.51a**) of a composition representative of alloys in **Table 17.6**. The gold layer varies in thickness and is burnished, but is still slightly porous, and its microstructure is very similar to that seen on the bronze wire from F.182. The gilding is very well bonded to the underlying uncorroded silver-copper alloy. EDX analysis detected up to 26 wt% residual mercury in the gilding with 39 wt% gold while the silver content of the gilding is around 30 wt% and is derived by interdiffusion from the silver-rich phase of the underlying wire alloy during the gilding process. Such high residual mercury implies that heating to remove the mercury during the gilding process was perhaps at a lower temperature or for less time than ideal. The gold layer has formed a perfect solid solution diffusion bond with the silver phase in the two-phase silver-copper core alloy and this produced a corrosion resistant join, which did not suffer the interface corrosion seen under the gilding of the bronze example above (**Fig. 17.50b**).

The other example of gilded bronze wire from torc G.6 is unusual, as it has been silvered before being mercury gilded, so it is a double-plated layer. The cross-section of this wire clearly shows a thick layer (*c.* 130 microns) of silver-copper eutectic underneath the thin surface gilding layer (**Fig. 17.51b**). It is difficult to explain the reasons for the choice of silvering the bronze wire in this case as it is the only piece

found so far and silvering bronze is indeed itself unusual (Oddy 1993, La Niece 1990). However, from a metallurgical viewpoint, the copper-rich phase of the eutectic silvering layer would bond very easily to the copper-rich bronze core, and the applied gold layer would bond easily to the silver-rich phase of the intermediate silvered layer by diffusion, better than it would directly to the bronze. The gilding layer was compacted by burnishing to remove the porosity left by the vaporised mercury and produce a shiny surface.

The identification of mercury gilding on several artefacts from Snettisham is significant and is the earliest evidence known for this technique in Britain (Northover and Anheuser 2000). This is a sophisticated metallurgical process showing a knowledgeable understanding of the behaviour of different metals by the ancient craftworkers. The knowledge of mercury gilding had to be gained, as well as a supply of mercury, and it would seem most likely that this represents a transfer of knowledge from the continent. Mercury is not indigenous to the British Isles in any significant deposits, and noted only as a rarity in a few locations in northern England (e.g. Greenland and Braithwaite 2012; The Hudson Institute of Mineralogy database https://www.mindat.org/min-2647.html) Therefore mercury must have also been sourced from the continent. A possible archaeological source for mercury used in the British Isles is Almadén, Castile-La Mancha, Spain (Higueras *et al.* 2011; Saupe 1990). Research by Perea *et al.* (2008) notes that '[...] the hypothesis of a local origin for fire gilding in Iberian times around 4th century BC [...] has emerged'. This implies the knowledge of the technique had already been established in Iberia before the period in which the Snettisham torcs were made and deposited.

Mercury occurs in limited mineral forms in nature but principally the bright scarlet/reddish-brown mineral cinnabar, mercuric sulphide, which itself was historically used as a red pigment. Mercury can also be found in its native, liquid metallic form as droplets associated with crevices and pores in its host mineral (e.g. https://www.minerals.net/mineral/mercury.aspx) and is formed by the natural oxidation of the sulphide ore (https://geology.com/minerals/cinnabar.shtml). It may be assumed that native liquid mercury was available at the continental source exploited by Iron Age metalsmiths. Aristotle in the 4th century BC described mercury as being like 'liquid silver' or 'water silver', while his student Theophrastus of Eresos (*c.* 371–*c.* 287 BC) wrote the earliest surviving scientific book on minerals, *De lapidibus (On Stones)*, and describes cinnabar of Spanish origin, and he states that quicksilver '... is made by pounding cinnabar with vinegar in a copper mortar with a copper pestle'. This can be reproduced experimentally. Further support for the Almadén region being the possible ancient source of mercury for the Snettisham material is its association with later Roman settlements and remains of cinnabar mines (Higueras *et al.* 2011). Pliny the Elder in Book XXXIII of his *Natural History* notes cinnabar with the presence of natural liquid mercury was also found in silver mines: 'There is also a mineral found in these veins of silver which contains a humour, in round drops, that is always liquid, and is called quicksilver.' Furthermore, Pliny also describes a distillation and condensation technology to collect vaporised mercury from heating cinnabar:

> ... getting hydrargyrum or artificial quicksilver ... it [presumably cinnabar] is put in an iron shell in flat earthenware pans, and covered with a convex lid smeared on with clay, and then a fire is lit under the pans and kept constantly burning by means of bellows, and so the surface moisture (with the colour of silver and the fluidity of water) which forms on the lid is wiped off it. This moisture is also easily divided into drops and rains down freely with slippery fluidity. (Pliny the Elder 1952, XXXIII, 123)

It is very unlikely for mercury to have been transported to Snettisham in its heavy liquid form. It was probably traded as a pasty-solid amalgam of gold made at source by mixing gold with liquid mercury, in the proportions of around Au 1: Hg 6. It is a simple task, as mercury dissolves gold very rapidly at room temperature forming the pasty material. Pre-amalgamating gold at the source would have had benefits both for ease of transport and ease of use: the pasty/solid amalgam could have been easily rubbed directly onto bronze at a metal workshop and then heated to drive off the mercury, leaving the gold on the surface for burnishing to finish the gilding process.

Surface treatments and colour

Much has been written on colour in relation to Iron Age metalwork, and the role of colour and alloy composition in the structure and ordering of the Snettisham hoards are considered in detail in Chapter 24. Whilst there is some apparent grouping and ordering of torcs by colour and metal content, it does not appear to have been the main structuring principle behind the nested torc hoards (G, H, J, K and L). As demonstrated here, objects in the fragmentary hoards (B, C and F) represent a broad spectrum of colours, from the palest silver to rich yellow-golds, and everything in between. When objects were deliberately grouped and interlinked in the hoards, there appears to have been an emphasis on diversity of colours and alloys, rather than attempt to group like with like, or express a clear preference for one colour over another.

Three types of surface treatments are seen on torcs at Snettisham: surface enrichment of gold and silver taking place as a natural result of wire production processes, more interventive surface enrichment similar to the chemical treatments used in gold refining and gilding of bronze and silver alloys. All of these had an impact on the colour of the finished object. The application of parting-like processes to gold alloys would have emphasised the yellow-gold colour of the metal, and the gilding of bronze and silver alloy torcs would likewise have given these a yellowish gold outer surface colour. The surface enrichment of lower-gold wire alloys had the effect of shifting the colour from whitish and yellowish gold areas of the ternary diagram towards whiter alloy colours and pale greenish yellow (see **Figs 17.46–7**). In many cases, however, these would have been very subtle colour shifts, and it is difficult to ascertain how important the colour of the finished object was in terms of influencing alloy selection. As argued above, the lower-gold ternary alloys selected for use in many of the wires at Snettisham may have been chosen as much for their metallurgical properties as for their colour. They are optimal in terms of

Figure 17.52 Group of thick and thin wire multi-strand torcs with ring, loop and buffer terminals (scale 50mm)

Figure 17.53 Three of the larger, heavier, more intricate multi-strand torcs, with torus terminals (scale 50mm)

providing the lowest possible melting temperatures and must have been easier to manipulate and work than many other combinations. However, there does seem to be a distinct preference at Snettisham for a range of colours on the right-hand side of the colour diagram shown in **Figure 17.47**, from whitish alloys to pale greenish gold and bright yellow gold. These colours may well have been conceptually related and, perhaps, preferred over the reddish colour of more copper-rich alloys. The most clearly intentional surface treatment, gilding, appears to have been applied most often to bronze objects, which would otherwise have tended towards this redder colour (Radivojevic *et al.* 2018).

17.6 Aspects of multi-strand torc manufacture and design

The majority of torcs from Snettisham are multi-strand types with neck-rings (and sometimes terminals) formed from wires of a variety of types and thicknesses, as discussed above. The colours of the torcs range from golden, through paler golds, to silver. These reflect the surface-enrichment techniques already discussed. A full typology of neck-rings and terminal types is given in Chapter 13, and the sheer variety can be appreciated through the range of torcs seen in **Figures 17.52–3**. Wires were combined in a variety of ways to make torc neck-rings, being either coiled around a core or plied directly together. The simplest wire neck-rings consist of just two wires plied together, while some, such as torc F.119–20, discussed in detail on p. 443, have neck-rings made from multiple stages of wire plying and coiling. The one common feature to all of these designs is that generally only one type and size of wire is used on each torc.

The range of terminal types is very wide (see **Fig. 13.3**). Some are formed from the thin or thick neck-ring wires/rods, ranging from simple loop terminals to more complicated 'cage' terminals (e.g. F.95, F.98, L.15). In some cases, loop terminals were thickened into closed-ring terminals by the overlapping and hammering of the wires or the addition of further material. Other types of terminals

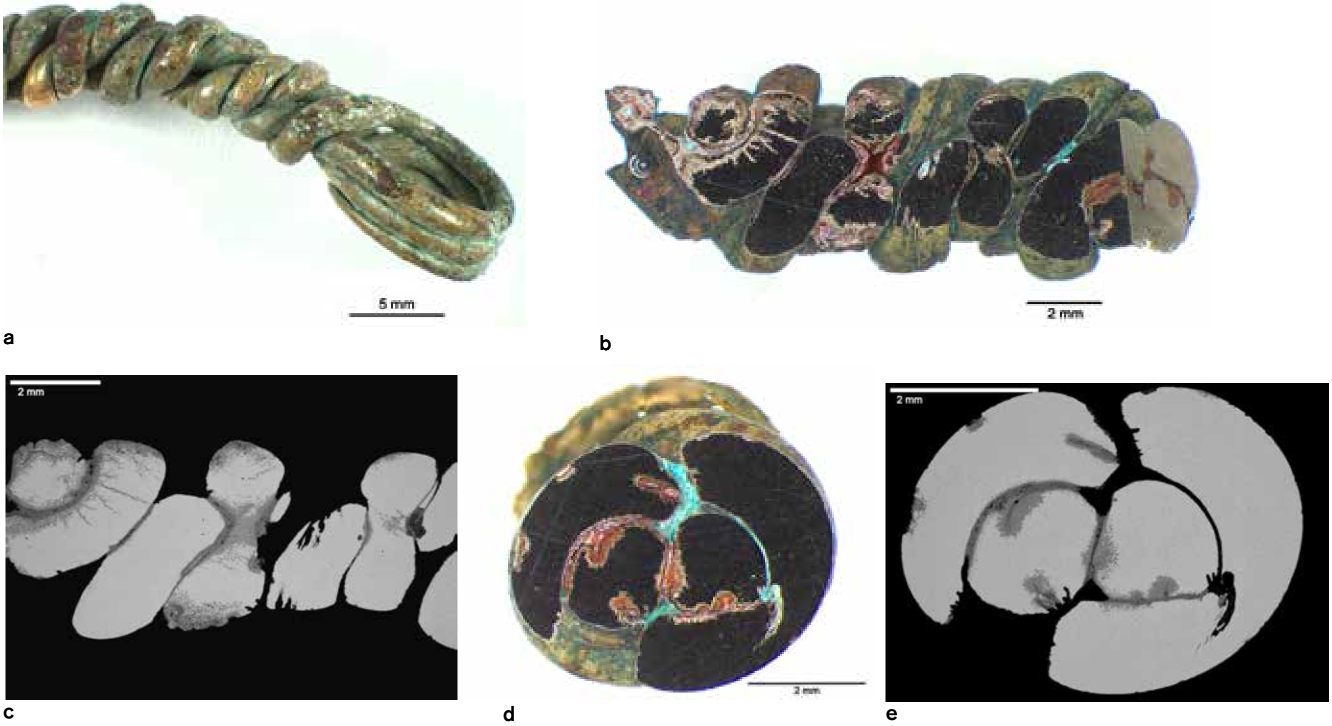


Figure 17.54a–e a) Bronze wire torc/bracelet F.361; photomicrographs (dark field illumination) of polished b) longitudinal and d) transverse cross-sections of tightly twisted ropes, each consisting of a pair of wires plied together S-twist. Note the green-blue corrosion products and red cuprite; c) and e) SEM BSE images of the same longitudinal and transverse cross-sections, showing the deep corrosion at grain boundaries and along folded grooves. Note the now corroded folded grooves leading from the surface into the wire, which result from the folding over of the corners of the original square-section rod used to make the wire during hammering

(buffer, torus or, in one case, reel form) were either cast or soldered onto the ends of the neck-ring wires. Soldered-on terminals could be formed from sheet or a combination of cast and sheet components, as found on the Great Torc. Presumably, these various types of terminals were being manufactured in parallel, if a relatively close dating of the hoard contents is suspected (see Chs 22 and 23).

Many cast and sheet terminals display a wide range of decoration from very simple to highly intricate and three-dimensional relief, including enhancements by engraving, punching and repoussé combined with chasing (see Ch. 21 for a full discussion of the decoration on the torcs). As explained above (see p. 425), repoussé/chasing and punching involve deforming the metal to create the motifs without removing any of the material being worked; in contrast, engraving requires cutting through the metal by hammering a sharp tool, such as a chisel, into the surface, to create decorative designs.

The range of torc terminal types seen at Snettisham surpasses those from any other single site in the UK, though a few precious metal torc terminal types known from other sites and thought to be contemporary do not appear in the Snettisham hoard (see Gazetteer in Ch. 22). These include the unusual wire torc from the Stirling Hoard, the sheet torc terminal from Clevedon, Somerset, the 'cushion'-terminal torc from Needwood Forest, Staffordshire and the torcs from the Ipswich Hoard in Suffolk. Five of the latter have neck-rings made from thick rods with ring terminals onto which (in four cases) thick additional relief decoration was cast, and in some cases further delineated (e.g. BM reg. no. 1969,0103.5 (Brailsford and Stapley 1972)), while one has a more complicated multi-strand neck-ring with unusual torus terminals (1971,0203.1).

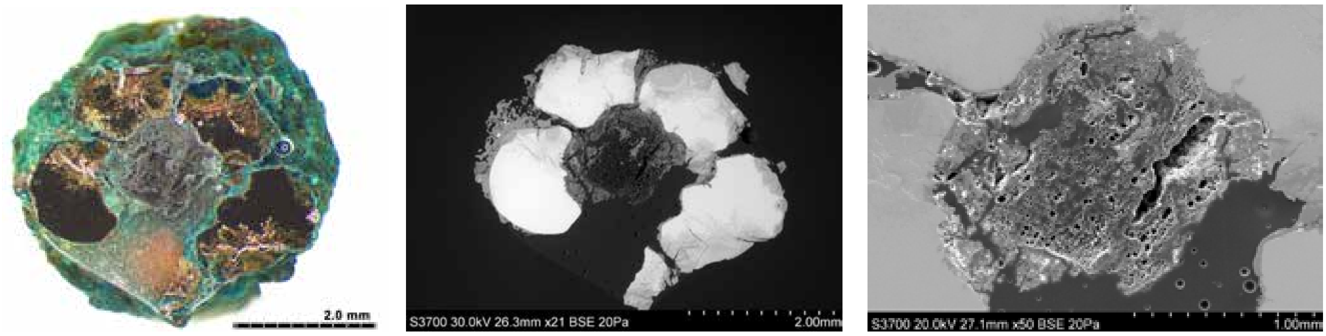
This section on the construction of multi-strand torcs is divided into four parts. The first (p. 454) discusses neck-ring construction, while the latter three cover terminal manufacture. Loop and ring terminals made from the neck-ring wires are addressed on p. 457, cast-on terminals on p. 458 and other forms of terminal manufacture (including sheet and composite terminals) on p. 464. The discussion is primarily restricted to torcs from Snettisham, but in some instances similar torcs from other sites are mentioned for comparison, including the finds from Sedgeford (Norfolk), Newark (Nottinghamshire) and Netherurd (Peeblesshire).

Neck-ring construction

The typology developed for the study of the Snettisham torcs (Ch. 13) distinguishes between plied and coiled elements in multi-strand neck-rings. 'Plied' applies to pairs or groups of wires twisted directly and tightly together (e.g. see **Fig. 13.8**), while 'coiled' is used in cases where the wires (usually four or more) are wrapped or twisted around some supporting medium, which was subsequently removed, so that the wires form a hollow tube (see **Fig. 13.9**). The simplest multi-strand torc neck-rings (Stage II examples) consist of just two wires plied directly together (see **Fig. 13.11a**) or a single coil (see **Fig. 13.11b**). In some cases, two or more such elements are coiled or plied together (see **Fig. 13.11c–e**) (Stage III constructions) and in a rare handful of cases there is a fourth stage of plying or coiling, giving the most complicated (Stage IV) neck-rings, as seen in torcs F.119–20, H.7, L.1 and L.21 (see **Fig. 13.11f**).

a b c

Figure 17.55a–c a) Corroded bronze torc fragment F.167; b) Photomicrograph and c) SEM BSE image of the corroded copper alloy wires and of the charred twig visible in the hollow centre of the torc



a b c

Figure 17.56a–c a) Photomicrograph and b, c) SEM BSE images of the polished cross-section of heavily corroded bronze torc/bracelet with five wires (F.250) surrounding a charred wooden support twig. Note how deeply the corrosion has penetrated the grain boundaries in the metal and deposited thick green corrosion on the outside of the wires; c) Note the cellular structure of the charred wooden core

Complex multi-stage plied neck-rings often combine different twist directions (S- and Z-twist – see Ch. 13 and especially **Fig. 13.10**), giving the appearance of a braid (see **Fig. 13.11c(ii)**), while in other cases a single twist direction (usually 'S') predominates (see **Fig. 13.11c(i)**). The latter case tends to result in a rather stiff neck-ring which appears tightly over-twisted, with a rather knobbly or knotted appearance (**Fig. 17.54**). This contrasts with the majority of symmetrically and uniformly twisted torcs.

Whilst plied neck-rings, with the wires twisted directly together, are relatively straightforward to manufacture, coiled neck-rings would have been more difficult to produce. As with plied neck-rings, some consist of a single Stage II coiled element (see **Fig. 13.9b**), whilst others combine Stage II plied or coiled elements to make a Stage III or IV neck-ring (see **Fig. 13.11d–f**).

Charred wooden cores in copper alloy torcs

The manufacture of coiled neck-rings raises the question of how to produce the perfect hollow form without it collapsing in on itself during twisting. The most likely solution would be to have a flexible or bendable core material present during bending (Cartwright *et al.* 2012; Ch. 19). Some of the small copper alloy torc fragments give a clue to the process. Caroline Cartwright (see Ch. 19) has studied and identified charred twigs found in the hollow centres of a number of fragmentary copper alloy (**Figs 17.55–6**).

The trapped charred twigs/stems must have been part of the manufacture of these small diameter torcs. The copper alloy wires appear to have been coiled tightly around a flexible twig to produce a uniform, hollow tubular torc shape. The twig cores prevented these coiled 'ropes' from collapsing onto themselves during the high mechanical torque while twisting wires and provided support during curvature to the final shape of the torc or bracelet. In this manner, it was possible to make elegant, uniformly spiralled wire torcs. The charring could have occurred during annealing, or potentially the casting-on of terminals, in cases where this technique was used. The charred material would then have been sealed in by the tightly coiled neck-rings and the terminals; the wooden cores only reveal themselves once a torc is broken.

In the case of the larger torcs and gold/silver alloy examples (e.g. **Figs 17.52–3**), there is no surviving evidence of support material for coiled wire ropes. Thicker flexible twigs may also have been used in these cases, but it could equally have been an annealed metal rod, either pre-bent to shape or possibly straight for the process of the coiling and then bent once the wires were coiled around it. Such a metal rod could be removed after bending and before affixing the terminals by casting or soldering. The advantage of a metal rod would be that during bending and manipulation of the large neck-ring, it would maintain its curved shape as an aid during complex construction, whereas a thick flexible twig, or similar, would spring open and be difficult to control.

Neck-ring construction case study: The 'Great Torc'

The manufacture of Stage III coiled torcs is typified by one of the most famous artefacts from the assemblage, the so-called Snettisham Great Torc (E.1a) (**Fig. 17.57**). This object is a supreme example of the tradition of goldsmithing of heavy gold torcs with multi-strand wire neck-rings and highly decorative terminals.

The design of the Great Torc neck-ring is based on eight 'ropes' coiled together in an S-twist direction, each rope being itself formed of eight circular-section wires of uniform

Figure 17.57 Snettisham Great Torc (E.1a), about 200mm in diameter

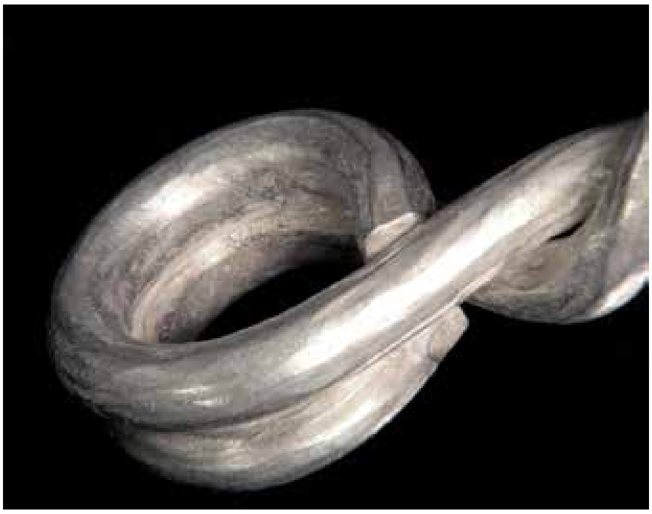
thickness, coiled tightly together S-twist. There is some evidence of linear faceting still remaining on the original wires, typical of the wire manufacture seen at Snettisham (see p. 429). A reconstruction of the torc made by the Department of Conservation at the British Museum (*c.* 1970) recreated many of the practical procedures necessary to create the heavy but flexible coiled wire neck-ring (**Fig. 17.58**).

The reconstruction was based on accurate measurements of the dimensions of the wires of the neck-ring. The methods used for making and subsequently coiling together the eight 'ropes' of the neck-ring are based on the practicalities of manual working of the heavy and springy metal construction (using brass wire in this case) and are thought to be broadly applicable to the original (**Fig. 17.58**). The replica terminals, being copper electroform copies made from silicone rubber moulds taken from the Great Torc, were made using a completely different process from the manufacturing method of the original artefact.

The first requirement was the production of wire of uniform thickness or diameter, which is illustrated by the experimental wire-making by John Fenn in this chapter (see p. 433). It proved challenging to produce large quantities of standardised wire, and this would have been an operation which required a great deal of skill. Fenn estimated that it would have taken at least 50 hours to produce the wire necessary for the Great Torc neck-ring.

Eight wires of the same length are brought together to make each of the coiled 'ropes' of the neck-ring. Coiling the wires requires the support of a solid central core, so that the very tight twisting does not collapse the wires together. For the reconstruction, a thick metal rod was used (**Fig. 17.58**). For the original, the core could have been a similar bronze or copper rod, but it could have also been a flexible twig, such as those preserved in some smaller bronze torcs (see below and Ch. 19). In the production of the replica, the coiled wires of each 'rope' were soldered together at one end so they could not untwist. Then, with the straight central rods still in place in each 'rope', the replica neck-ring was assembled around a straight, thick, round metal rod of a diameter such that it allowed the eight 'ropes' to just touch

Figure 17.58 Reconstruction components of the Great Torc by the British Museum Department of Conservation. Note the different stages in the wire construction: (from top to bottom) the eight individual wires, the supporting central wire/rod protruding from the eight wires before twisting into a 'rope', and the twisted wires with soldered ends to prevent untwisting; (left) the thick (now curved) metal core to support the 'ropes' during coiling and bending the neck-ring to shape and a cross-section of the neck-ring with the core support removed; (right) the clamped ends of the coiled neck-ring, needed to keep the twisted wires permanently in the curved position, showing the uneven extended 'ropes' from the bending operation; and some of the straight-cut ends of the neck-ring 'ropes' (as seen in the Great Torc X-radiographs, Figs 17.82–4). In this reconstruction, the completed terminal on the right-hand side is an electroform copy. There is also a complete replica of the Great Torc (not pictured)



a

b

Figure 17.59a–b Open-loop thick wire torc terminals (L.7)

a

b

Figure 17.60a–b Overlap joins seen in the interior of terminal loops on torc L.4 (arrow)

side-by-side around it. Measurements show that this core rod for the neck-ring had to be twice the diameter of an individual 'rope' to produce a tightly coiled neck-ring. This is indeed the case for the Great Torc.

The next step was to coil the ropes themselves around one another. At one end, the eight coiled 'ropes' were fixed with a collar and clamped or fixed (soldered) to allow twisting from the other end. The 'ropes' were then coiled together as tightly as possible around the core rod in a linear manner with some considerable torque force. As mentioned, the eight smaller core rods inside the individual 'ropes' prevented them from collapsing.

At this point, the replica neck-ring was still straight. The next stage, curving it into the final torc shape, is tricky, because the 'ropes' have to slip over one another while bending to take the final form. Simply trying to bend a straight multi-strand coiled neck-ring with two fixed ends could not work, because the outer curvature is considerably longer than the inner curvature and neither the outer could stretch nor the inner compress sufficiently to make or retain the curve. Once curvature was achieved, the free end had to be clamped or soldered like the first to hold the form without untwisting. This construction will now permanently maintain the correct curvature, as it cannot revert to a straight configuration. Indeed, it has an inherent springiness that allows the finished torc to flex and return to shape for putting on and taking off around the neck of the wearer.

At this point, the wire cores of the eight 'ropes' and the main core rod could be removed, leaving the springy final curved form of the torc body. The final stage would be to cut the wire ends square to the required length in preparation for the addition of the terminals (see p. 467). The straight-cut ends of the eight multiple-wire 'ropes' can clearly be seen in the X-radiographs of the Great Torc (see below, **Figs 17.82–4**).

Multi-strand torc terminal construction: Loop and ring terminals

The terminals of simple Stage II and III plied torcs are of two main types: loops (which may be open, with an end to the wire, or continuous loops made from a piece of wire that does not end within the area of the terminal) and thickened, closed rings (**Figs 17.59, 17.61** respectively). Most loop terminal torcs from Snettisham have between one and three loops on each side, generally formed from the ends of the neck-ring wires, as described in Chapter 13. A single example (L.4) (**Fig. 17.60**) has quadruple-loop terminals, as does a torc from Ulceby, Lincolnshire (see Gazetteer in Ch. 22). Torc L.7 shows the simplest kind of loop terminal construction (**Fig. 17.59**). Each terminal has two adjacent loops, one from each neck-ring wire, bent round a mandrel in opposite directions with gentle hammering of the square-cut ends to close each loop against itself to be a close fit.

It is likely, as seen in the experimental wire manufacture section (p. 433), that in simple cases such as L.7 the process of making the torc involved first making and cutting the wires to length, then pre-forming the wire loops and using these with the mandrel or a rod passed through the loops to

a b

Figure 17.61a–b Silver alloy torc S.16, face and side views showing detail of round-section and closed-ring terminals with overlap joins

Figure 17.62 Terminal of torc S.17, which retains its sprues from the casting-on of additional metal to create the thickened ring terminals

provide leverage to twist the neck-ring wires tightly together. The amount of torque power needed to twist two thick, straight torc wires together is considerable and annealing the wires before twisting would have been likely. The loops would probably have needed reshaping somewhat after twisting. The completed straight twisted assembly would then have been bent into the familiar curved ring-shape of the finished torc.

Sometimes, rather than the neck-ring being formed of separate wires, as seen on L.7 (where each double terminal has two open loops), it appears to be made from a single wire folded over in the middle with a closed loop terminal at one end and an open loop at the other (e.g. bracelet F.121) or even gives the appearance of being formed from a single, continuous length (e.g. torcs H.5 and H.6). In the latter cases, the wire ends around the terminals have likely been soldered or hammered closed. Hammered overlap joins can be seen inside the loop terminals of L.4 (**Fig. 17.60**).

In some cases, this closing of the terminal loops has been taken further, with significant thickening of the loops to create tear-shaped closed rings which appear more bulbous and thicker than the main neck-ring wires. The closing mechanism for completing the ring terminals of these torcs appears to be shaping and overlapping the wire ends and soldering them along the long seam (**Fig. 17.61**). Another possibility could be casting-on more metal, in a similar way to the Ipswich torcs (e.g. BM 1969,0103.5 (Brailsford and Stapley 1972)), which have more refined ring terminals with cast-on decoration. On torc S.17 (**Fig. 17.62**), the two terminals retain their sprues from the casting-on of additional material to create the thickened rings.

In a small number of cases, multiple ring terminals are formed from the addition of sheet or cast elements to the original neck-ring loops. This is seen, for example, on torcs L.16 and L.18, and is described in detail in their catalogue entries in Chapter 14. It is notable in all cases where additional metal was added to complete the terminals, that care must have been taken to match the surface-enriched colour of the torc wires to the cast or sheet elements. This would have required a good deal of skill and careful consideration.

Multi-strand torc terminal construction: Cast buffer, torus and reel terminals

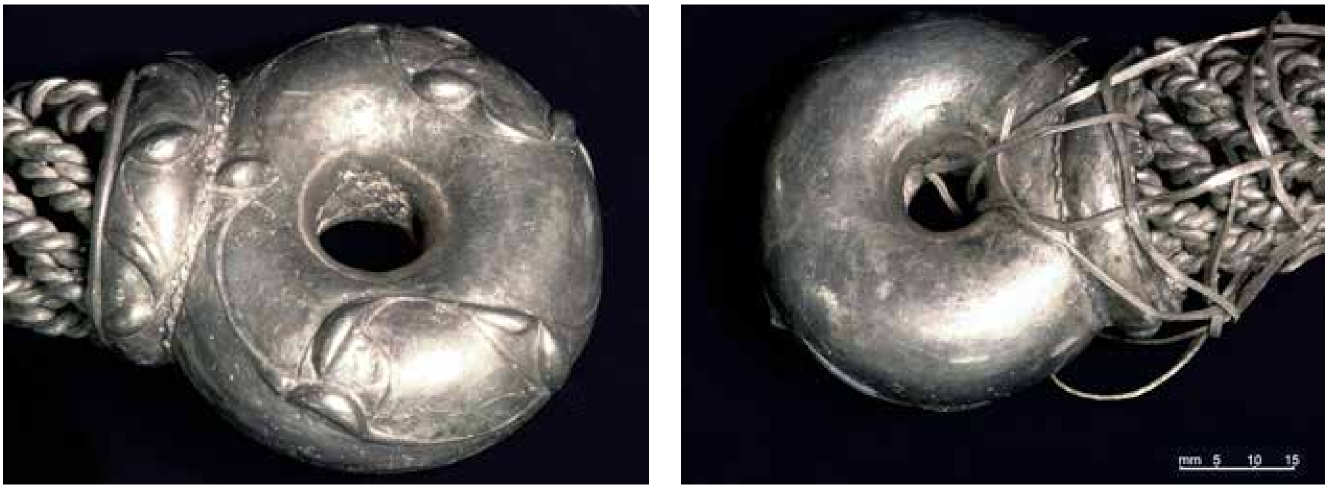
Cast and cast-on terminals are a major feature of many multi-strand torcs, from very small ones to the largest. We will look at the various torcs and see the similarities and differences in the cast terminals, but overall, the process of lost-wax casting is the same. The desired form of a terminal was sculpted in wax (probably a beeswax mixture) on a clay core, and an outer layer of clay applied to form the external part of the mould. Two main forms of terminals were cast: buffer terminals, which might be simple caps to the ends of a coiled wire neck-ring, and more complicated hollow torus terminals. There is also one example of an open reel terminal (F.119–20) (see Ch. 13, **Fig. 13.1**, for full terminal typology).

There are two methods used for cast terminals: some were cast as separate components for later attachment to neck-rings (by soldering or mechanical attachment, see Sedgeford Torc case study, below), and others were cast directly onto the neck-ring wires (see case study below on F.120, L.21 and S.19).

Hollow torus terminals cast directly onto the ends of the neck-ring wires each needed a 'doughnut-shaped' clay core, which was also used to plug the open ends of the wire torc body for the cast-on terminals to prevent molten gold flowing too far. The clay core would have been thoroughly dried out, before the wax model of the terminal was crafted over the clay. The core would otherwise have failed dramatically during heating to burn out the wax, as the retained water would create high steam pressure in the clay. A wax reservoir sprue and wax runners and risers, to provide channels for molten gold to run in and air to escape, would also have been attached to the wax model. The final procedure for finishing

a b

Figure 17.63a–b a) Cast terminal of torc L.21 showing prominent decorative motifs with chased outlines, and b) dot-punched decoration along the thin wavy line where the torc terminal meets the collar. Note the small casting defects in the collar



a b

Figure 17.64a–b a) Front and b) back of terminals of torc L.21, showing the oblique angle of entry of the wires into the cast-on terminals, and decoration on the front side (scale 15mm)

the mould would be to carefully cover the wax model with clay to mould exactly over the wax, probably using clay slip as the first layers to ensure accurate rendition of the wax design (Craddock 2014). The completed terminal mould would be thoroughly dried and then gently heated to several hundred degrees centigrade in a hearth to melt and burn out all the wax and harden the clay moulds. The mould needed to be maintained at high temperature prior to casting to facilitate good metal flow to all parts of the mould, preventing premature solidification, miscasts and cold-shuts from forming, such as those seen on torc L.21 (see below, **Fig. 17.68**). Gold alloys would be heated to around 1050–1100 °C before being poured into the mould. Given that there is generally a close visual match between the colour of the cast terminals and the colour of the neck-ring, care must have been taken to select an appropriate alloy that, when cast, would match the surface-enriched neck-ring wires. When cool, the clay mould was broken open, the cast terminal cleaned up and the clay core could potentially be removed through the neck of the terminal.

The practicalities of the casting process were probably similar to those of experimental procedures used for casting small bronze objects (Tulp *et al.* 2001; Meeks *et al.* 2001). In these experiments the clay lost-wax moulds were first placed carefully onto the outer edge of a pre-heating hearth to allow them to dry slowly for two hours and melt out the wax model leaving the hollow mould ready for the molten metal. The moulds were then moved further into the hotter regions of the hearth for several hours to fully dry them by driving out chemically bound water at about 400–500°C, and to bake and harden them, but not fire the clay (i.e. kept below around 800°C as the moulds have to be broken open to release the torc after casting). The molten metal would then have been poured into the terminal moulds. These preparatory conditions ensured that the clay mould performed correctly during the high-temperature thermal shock conditions of pouring in the molten metal at about 1050 °C. The temperature of these pre-heating and casting processes would easily char the support twigs that are found within some of the smaller multi-strand wire torcs (Ch. 19).

The majority of the decorative patterning on many terminals is cast, and so must have been modelled into the wax (e.g. **Fig. 17.63a**), but a fair amount of finishing work

a b c

Figure 17.65a–c Torc L.21 with the wires mechanically trapped by the solidified casting metal

Figure 17.66 Torc F.120 (see also Fig. 17.40), cast reel terminal with open neck; note the cast terminal dribbles running over the wires (centre left)

was applied by hand to the cast terminals to add further details and sharpen up the designs by chasing lines around the larger prominent decorative motifs. A good example of punched dots and chased wavy decoration can be seen around the neck of the cast-on terminals of torc L.21 (**Fig. 17.63b**).

Most cast terminals appear to have been cast directly onto the neck-ring wires. It is clear from the oblique angle at which the wires enter the terminals that the neck-rings were twisted into their final form *before* the terminals were cast on, otherwise the wires would enter straight into the terminals (**Fig. 17.64**). Casting onto the pre-twisted neck-ring has the major advantage of permanently locking the twist into place, as there is no way that the neck-ring wires can untwist or uncoil themselves. Similarly, curving the neck-ring before casting-on the terminals allows all the wires to move over each other during shaping. Because the inner side of the curved neck-ring is shorter than the outer, casting-on the terminals fixes the curvature into place, preventing the torc from springing open.

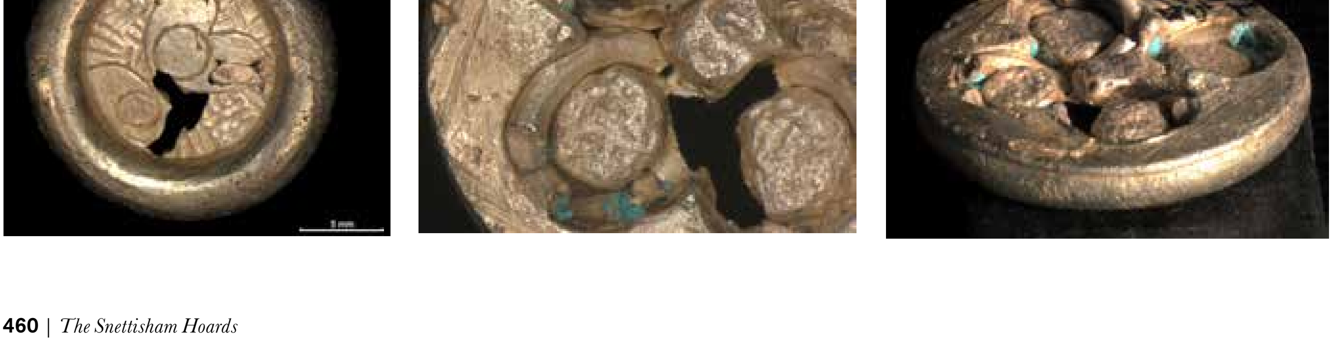
Until fairly recently, it was assumed that casting-on was the method used for almost all torus, buffer and reel terminal torcs, with a handful of exceptions such as the metal terminals of the Grotesque Torc and F.72. Subsequent work has revealed alternative manufacturing routes in several cases (see: the sections on the Great Torc and Sedgeford Torc below, and Machling and Williamson, 2016, 2018).

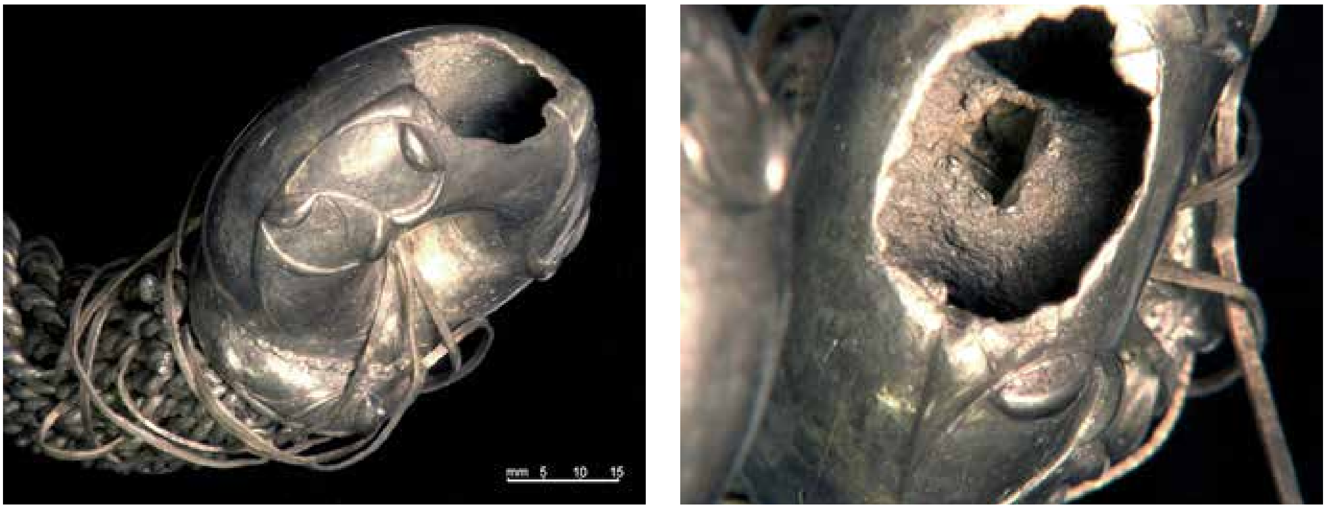
Cast-on terminal case studies: Torcs F.120 (reel terminal), L.21 (torus terminal), S.19 and torc/bracelet F.179 (buffer terminals)

The evidence of casting-on is clearly seen on torc L.21, with the wires mechanically trapped by the solidified casting (**Fig. 17.65**). The terminals are hollow, so there must have been a clay core to the mould, and this would have also plugged the hollow end to the neck-ring, where the wires enter the terminals, to stop the molten metal running into the neck-ring. The wax model would have encapsulated the outer ends of the wires, being then encased with an outer layer of clay. Similar manufacturing evidence is seen on F.120 (**Fig. 17.66**) and S.19 (**Fig. 17.67**), where molten metal has flowed over and around wires. In the latter case, however, the cooler wires chilled this molten metal before it had a chance to fuse (self-solder) to them, but formed very secure and tight mechanical joints.

Figure 17.67a–c Cast buffer terminal on torc S.19: a) engraved pattern outlines with punched basket-weave infill (scale 5mm); b) and c) reverse side of the cast-on terminal: the terminal metal encases the neck-ring wires but is not fused to them

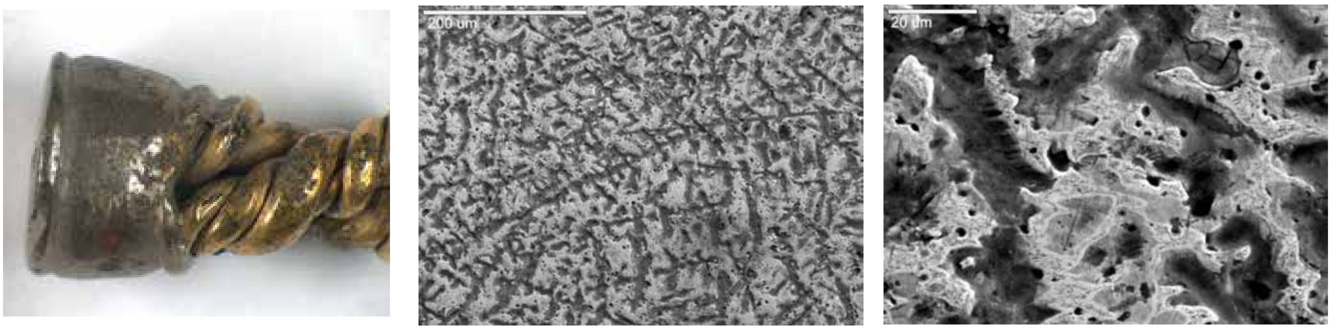
a b c





a b

Figure 17.68a–b Torc L.21 with a massive cold-shut casting defect in one terminal and no apparent attempt to repair it in antiquity



a b c

Figure 17.69a–c Bronze torc/bracelet F.179: a) silver-coloured terminal on a small bronze torc fragment; b) and c) SEM BSE images of the dendritic surface microstructure typical of the high-tin are $\alpha+\delta$ eutectoid intermetallic compound (Meeks 1993) (image widths: b) *c.* 500 microns and c) *c.* 80 microns)

For practical reasons, one could suggest casting-on hollow terminals with the terminals pointing downwards to prevent inadvertent escape of molten metal along the wires, which could occur if the terminals were cast pointing upwards with the wires below. This is clearly demonstrated on one simple solid cast-on buffer terminal from torc S.19, where the ends of the wires are encapsulated by the cast metal (**Fig. 17.67**). The positioning of the terminals for casting may have depended on torc type; the simple ring terminals of multi-strand torc S.17 (**Fig. 17.62**) retain sprues, their position suggesting that the additional metal to thicken the terminal was cast on with the terminals lying on their sides.

Some terminals are imperfect and have various casting defects, such as the massive cold-shut defect in one terminal from torc L.21, which shows an area completely missing (**Fig. 17.68**). This casting defect is caused by either a trapped air pocket in the mould, around which the metal solidified, or by the metal having begun to solidify before fully filling the mould, due to chilling by a cold mould or low metal casting temperature (Hanson and Pell-Walpole 1951). The rounded edges of the hole are typical of the solidification front of the melt and not of subsequent physical damage. No attempt seems to have been made in antiquity to repair it. Looking right into the hollow terminal shows an oblong hole passing through the metal wall into the inner 'doughnut'. Its function is unclear, but is unlikely to be deliberately cut into the metal, so could be another cold-shut casting defect. The rough texture of the original mould surface is also seen inside the terminal (**Fig. 17.68b**).

Whilst most cast-on terminals used similar alloys to those seen in other torc components, one small bronze wire torc/bracelet fragment (F.179) has a silvery-coloured terminal which was made from an unusual alloy (**Fig. 17.69a**). SEM imaging and elemental analysis revealed that this terminal was made of high-tin bronze (*c.* 20 wt% Sn). The surface displays the characteristic cast dendritic eutectoid microstructure of the hard, high-tin delta compound (**Fig. 17.69b–c**). It has a polished colour that is very similar to

Figure 17.70 Sedgeford Torc terminals: detached terminal (left, BM 2005,1103.1) and terminal attached to the neck-ring wires (right, BM 1968,1004.1)

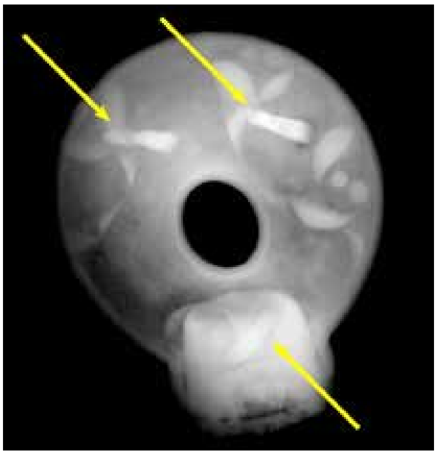


Figure 17.71 X-radiograph (DR) of the detached Sedgeford Torc terminal (see Appendix at the end of this chapter for terminology). The cylinder holding the broken-off neck-ring wires (Figure 17.70 left) can be seen at the base of the terminal. The yellow arrows point to the internal chaplets; the lower one is probably a rivet

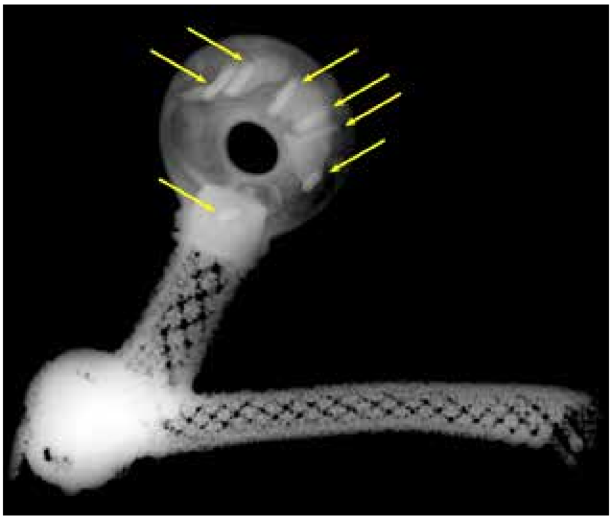
silver. This peculiar artefact only adds to the interesting and varied mixture of materials seen across the assemblage, as silver-coloured high-tin bronze castings are a very special type of alloy and technology application not seen in the rest of the Snettisham hoards. Besides, high-tin bronze was generally deliberately used in the ancient world for specific and completely different types of artefact such as Roman and Chinese mirrors as well as some early medieval buckles and belt fittings (Meeks 1993).

Separately cast terminal case study: The Sedgeford Torc

It is instructive, when exploring the variety of terminal construction methods, to compare objects from Snettisham to similar artefacts from elsewhere in the UK. One gold/silver alloy torc with separately cast and mechanically attached terminals was found at the nearby site of Sedgeford, Norfolk (BM 1968,1004.1 and 2005,1103.1 **Fig. 17.70**; see Gazetteer in Ch. 22; Brailsford 1971; Jope 2000, 84, 254, pls 114–15; Hautenauve 2005, 238, no. 153). The main part of the torc, comprising a hollow torus terminal and most of the coiled neck-ring, was discovered in 1965. The missing broken-off terminal was subsequently found at the same location in 2004. The torc had apparently been struck during ploughing, which had severed one terminal and damaged the neck-ring wires (**Fig. 17.72a**). X-radiography of the torc was carried out at the British Museum (**Figs 17.71–3**), and the resulting images show that the torus terminals are fully cast.

The radiographs show the presence of chaplets used in the casting of these terminals. Chaplets are small metal supports that bridge the gap between the inner clay core and the clay mould surface. These would have provided structural stability for the clay core during the casting process, which would most likely be the lost-wax casting technique, widely used at the time and explained in detail above. A total of seven chaplets can be seen in the terminal still attached to the neck-ring, and three chaplets in the detached terminal (**Figs 17.71–3**). Photomicrographs of the detached terminal also show dendrites on the inner surface of the torus core (**Fig. 17.76a–c**), further confirming that these terminals were cast. Three of the features seen on the radiographs of the terminal still attached to the wires may be rivets, rather than chaplets, also visible externally on

a



b

Figure 17.72a–b a) The larger fragment of the Sedgeford Torc, BM 1968,1004.1 with the attached neck-ring wires; (b) X-radiograph (DR) of the Sedgeford Torc terminal. The six yellow arrows within the torus of the terminal point to the chaplets inside the terminal, while the lower one at the collar points to a rivet

Figure 17.73 X-radiograph (DR) of the attached Sedgeford Torc terminal. The short internal cylindrical cap/tube holding the ends of the neck-ring wires is similar to that of the detached terminal and can be seen to be separate from the terminal neck in the close-up image

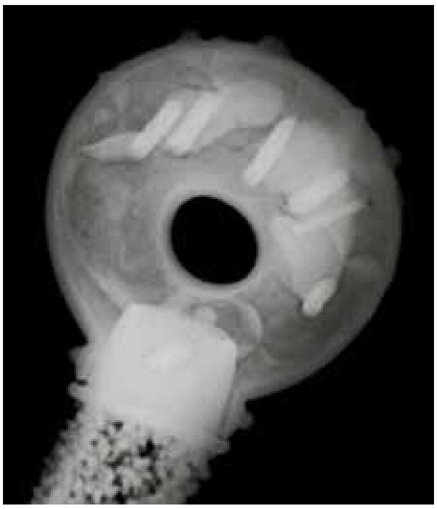


Figure 17.74 Rivets are seen along a crack line on the reverse side in the attached terminal of the Sedgeford Torc, and appear to have been repairs and concealment at the time of manufacture. Scale in mm

Figure 17.75 Detached Sedgeford Torc terminal: detail of the twisted and coiled wire ends fused to the tubular cap, and the thick rivet rod which secures this end tube or cap to the terminal (x20)

a b c

Figure 17.76a–c a) Photomicrographs of dendrites and characteristic surface textures from fusion on the inner surface of the end tube/cap, resulting from its soldering to the wires (left of image), within the detached Sedgeford Torc terminal (x50, width of image 7mm); b) SEM BSE detail of the dendrites within the dirty (darker grey) surface of the solder. Both a) and b) show the drilled hole for the rivet cuts through the dendrites; c) dendrites and characteristic surface textures from casting inside the detached terminal core beyond the rivet (bright horizontal bar at the bottom of the image) and end tube/cap (x50, width of image 7mm)

Figure 17.77 Fluted collar soldered to the neck-ring wires (x30, width of image 12mm) on the Sedgeford Torc. The fluting on the collar appears similar to that of the Netherurd terminal shown in Figure 17.81

Figure 17.78 Detail of the decorated neck-flange of the detached terminal of the Sedgeford Torc, showing the flush rivet head outline (top centre of image) and fluted collar (bottom of image), the cast-in hemispherical beading and basket-weave punching. Note the gap running between the fluted collar and the neck-flange (x30, width of image 12mm)

either side of the terminal, with flat and round hammered heads. These three rivets run along a crack and suggest an ancient repair at the time of manufacture (**Fig. 17.74**).

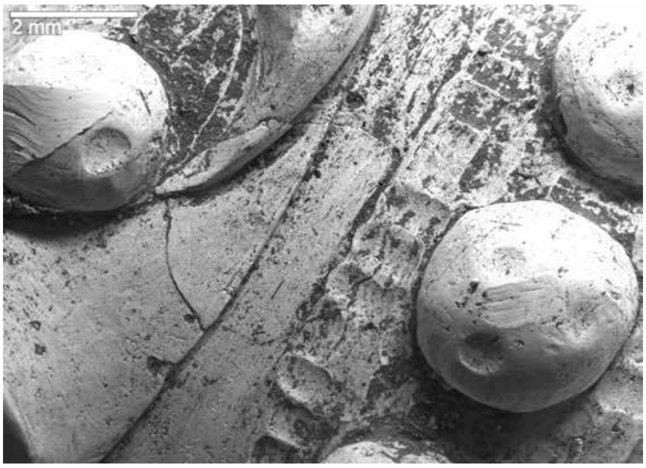
The radiographs (**Figs 17.71–3**) also show that the ends of the neck-ring wires are fitted into a thick, short tube or cap, which encloses the multiple twisted wires for insertion into the hollow neck of the cast terminals. This cap has a fluted collar, seen externally, where it meets the neck-ring, giving the effect of beaded wire (**Fig. 17.75**) and is a separate component from the terminal torus. The detached terminal clearly displays solder dendrites on the inner surface of this

Figure 17.79 SEM BSE image of the Sedgeford Torc terminal still attached to its wires: detail of the gap between the fluted collar and the terminal, which extends completely around the neck (scale bar *c.* 2mm)

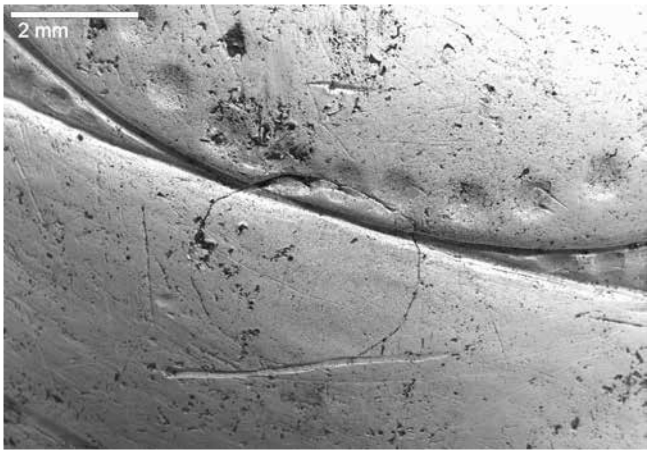
end tube/cap, where the neck-ring wires are firmly attached to it (**Figs 17.75–6**). The decorative fluted collar is also well soldered to the bottom of the end cap to disguise the join with the wires (**Fig. 17.77**). However, although the neck-ring wires are soldered to the cap, the cap itself is not soldered to the terminals, as shown by the gap between them in the X-radiographs (**Figs 17.71–3**). There is also a clear gap between the fluted collars and the terminals running all the way round, showing that the end tubes/caps are not directly soldered to the terminals (**Figs 17.78–9**). Instead, the attachment of the soldered neck-ring and tube assembly to the terminals was mechanical.

The completed neck-ring wires with soldered end tubes and decorative (fluted) collars were inserted into the cast terminals and each secured mechanically by a single thick rivet (*c.* 2.5mm diameter). This rivet passes fully through a

Figure 17.81 Torc terminal from Netherurd, Scotland. National Museums Scotland, X.FE 46. Image © National Museums Scotland



a



b

Figure 17.80a–b SEM BSE images of the rivet ends on the detached terminal of the Sedgeford Torc; this rivet is mechanically fixed and its ends are burnished and concealed within the punched and chased decoration, only the circular outline of the end of the rivet remains (scale bars *c.* 2mm)

pierced or drilled hole in the flange region of the terminals and in the internal tube wrapping the wires (**Figs 17.75–6**). The rivet holes cut through the solder dendrites, indicating that they were drilled after the end tube/cap was soldered to the wires. The ends of the rivet are concealed externally through burnishing and within the chased and punched decoration (**Fig. 17.80**).

Multi-strand torc terminal construction: Other forms of terminal manufacture

A small number of multi-strand torcs have unusual terminals formed from sheet or a combination of cast and sheet components. Two of these, the Great Torc and Grotesque Torc, are discussed in detail here.

Composite terminal manufacture case study: The Great Torc

The hollow terminals of the Great Torc (E.1a) have finely decorated, prominent design features that had always been thought to be formed by lost-wax casting directly onto the neck-ring terminals, as reported in Joy (2015), similar to other torcs from Snettisham and elsewhere. The Great Torc is complete, meaning direct internal examination of the terminals was not possible, unlike the fragmentary Sedgeford Torc, which has a detached terminal that could be viewed internally from the broken wire end to confirm

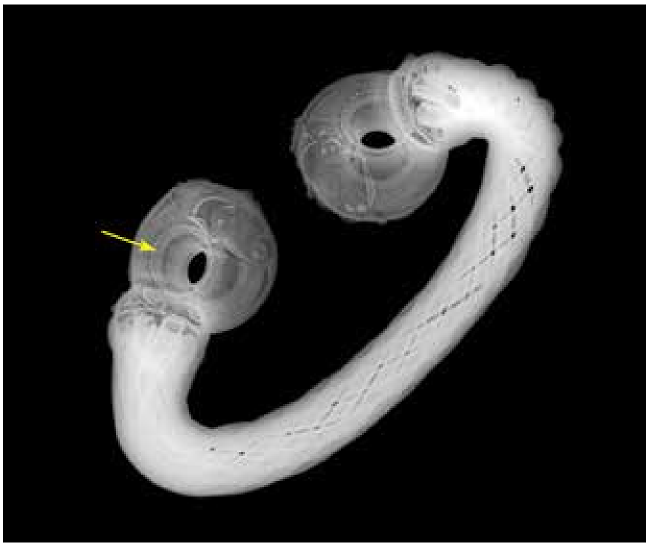


Figure 17.82 Oblique view X-radiograph (CR) of the Great Torc (corresponding colour image Fig. 17.57; see Appendix at end of this chapter for terminology). The arrow indicates the brighter, ring-shaped band that appears where the concave tubular sheet overlaps with the torus

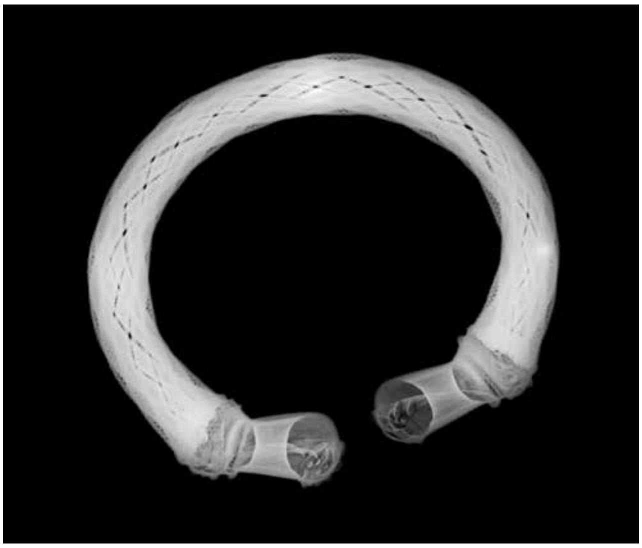
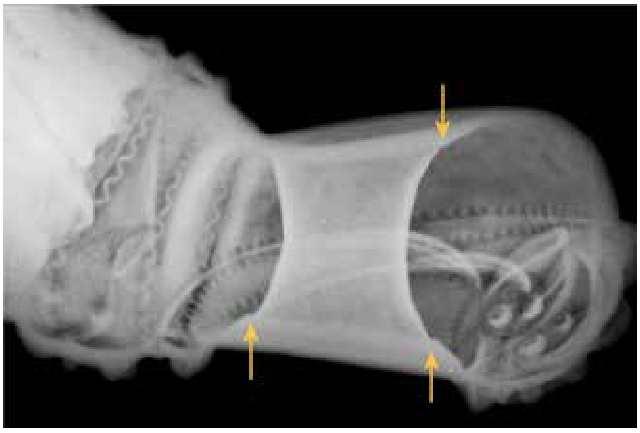
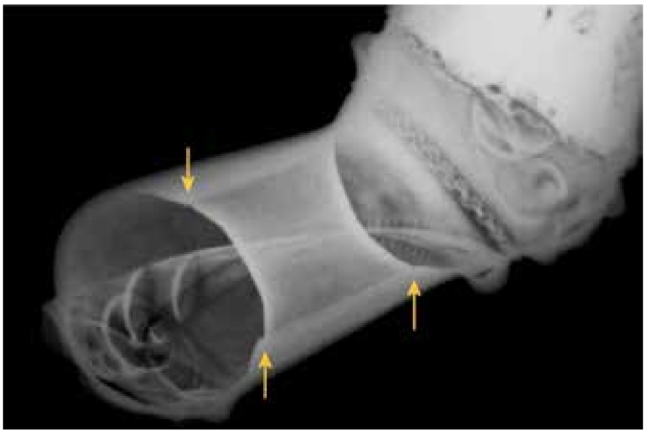


Figure 17.83 Axial view X-radiograph (CR) of the Great Torc. Note the brighter concave tubular-shaped sheet creating a hollow core within both terminals (see details in Fig. 17.85)



a



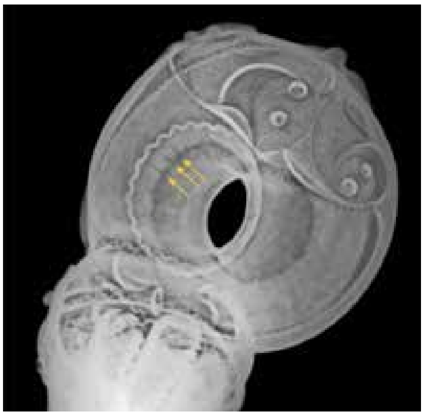
b

c

Figure 17.84a–c Close-ups of a) the left and b) the right terminals in Figure 17.83: the arrows indicate the overlap and discontinuity between the concave tubular sheet creating the hollow core and the main torus of the terminal; c) Photograph of the terminals for comparison

Figure 17.85a–c a–b) Enhanced X-radiograph (CR) detail of the two terminals showing the cuts (yellow arrows) along the edge of toroidal metal. Note the similar X-ray attenuation of the collars overlapping the wires of the neck-ring to the main torus; c) Optical detail of terminal in similar orientation to image (a)

a



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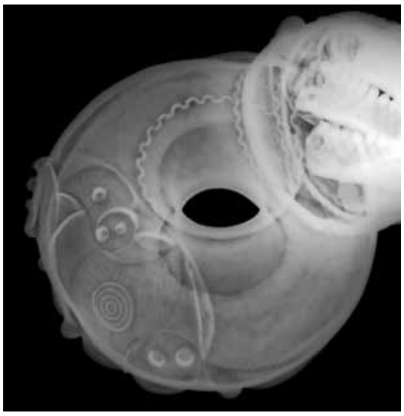
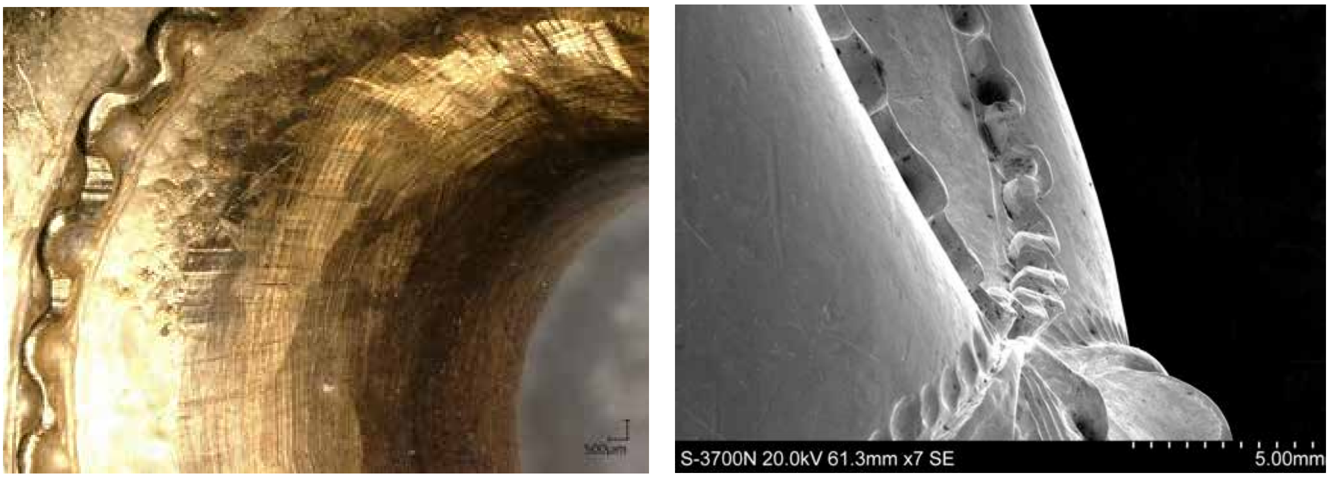


c



a b

Figure 17.86a–b a) Photomicrograph (width of view *c.* 17mm, x20) and b) SEM SE image of a Great Torc terminal showing fine hammer marks on the concave tubular core sheet of the terminal eye near the wavy decoration, where it overlaps with the toroidal component, and punched decoration enhancing the wavy strip that disguises the overlap join. Linear scraping is probably post-excavation

Figure 17.87 Edge of the tubular concave core sheet against the wavy decorative strip on a Great Torc terminal, which has partially detached, around the central hole (scale 1mm; x30, width of image 12mm)

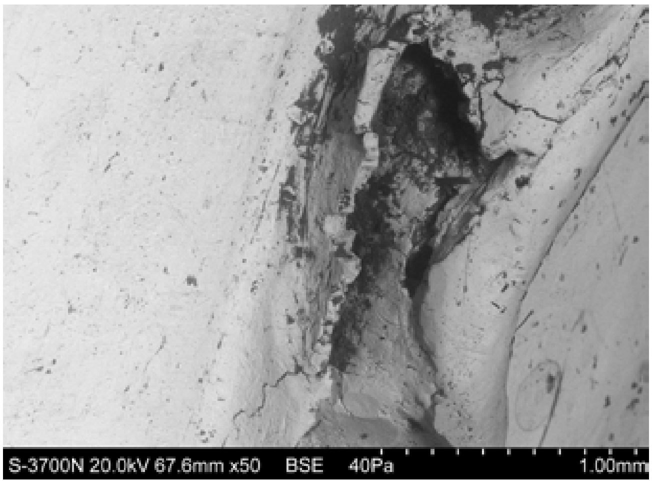


Figure 17.88 SEM BSE image of a damaged region of the Great Torc terminal core sheet edge (sheet from left and folded vertically, centre) adjacent to the wavy decoration (right) of the soldered overlap region shown in Figures 17.86–7

that the terminal component was cast (even if, in that case, not directly onto the neck-ring).

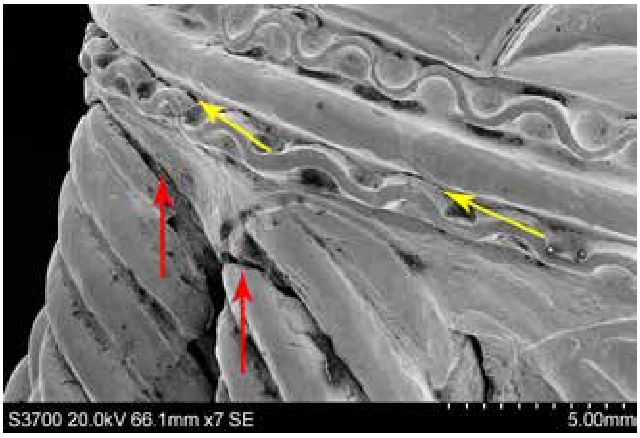
However, our understanding of the complexities of Iron Age goldsmithing is constantly evolving. Around 2016, work by Machling and Williamson suggested that another Iron Age torc component, the detached Netherurd terminal (National Museum of Scotland, **Fig. 17.81**) was formed from two separate pieces of gold alloy sheet: an internal hollow concave 'apple core'-shaped gold sheet and the main surrounding toroidal piece (Machling and Williamson 2016). Since the Great Torc (**Fig. 17.57**) shares some visual characteristics with the Netherurd terminal (**Fig. 17.81**), Machling and Williamson raised the possibility that the same might be true for the Great Torc.

A comprehensive study of the terminals of the Great Torc was subsequently carried out. This study combined new high-power X-radiography, to penetrate the thick gold terminals, and high-resolution imaging using optical microscopy and SEM to record technical details which had not previously been possible (Meeks *et al.* 2014). This enabled comparison of its construction with the Grotesque Torc (L.19), which has gold sheet terminals (see below), and the Sedgeford Torc (BM 1968,1004.1 and 2005,1103.1), which has cast terminals (discussed above). The results revealed that aspects of both theories (cast and sheet construction) were correct, with the Great Torc terminals being made separately from both cast and sheet components, before being soldered onto the neck-ring.

Gold has a high density and atomic number, and therefore strongly attenuates X-rays. Any thickness of gold or high-purity gold alloy from *c.* 0.3mm upwards presents a challenge for X-radiography due to heavy absorption (loss of signal) and scatter (poor edge definition). These effects were mitigated in this work by operating the X-ray tube up to the maximum power and with strong filtration of the incident X-ray beam. In light of this, the well-defined X-ray images of the Great Torc's terminals point to the metal being relatively thin (**Figs 17.82–5**), compared with the blurred edges seen on the images of the cast Sedgeford Torc terminals (**Figs 17.71–3**) caused by the thicker metal.

X-radiography of the Great Torc suggests that each terminal is made up of at least two separate components: a main toroidal element with its neck collar, and a central core that closes the central hole or 'eye' of the terminal.

a



b

Figure 17.89a–b Great Torc a) Macrograph (image width *c.* 65mm) showing start and end of shrinkage crack between the torus and neck, detailed in Figure 17.92, and the 'infill' between wire ropes and neck; b) SEM SE image of an 'infill' region between the neck-flange and wires with evidence of stress corrosion and fatigue cracking (red arrows) through some of the wires and thin gold infill. A thin gap can be seen along the top of the wavy decoration strip (yellow arrows); this might suggest an attached wavy strip, similar to those around the eye of the torus terminal (Figs 17.86–7)

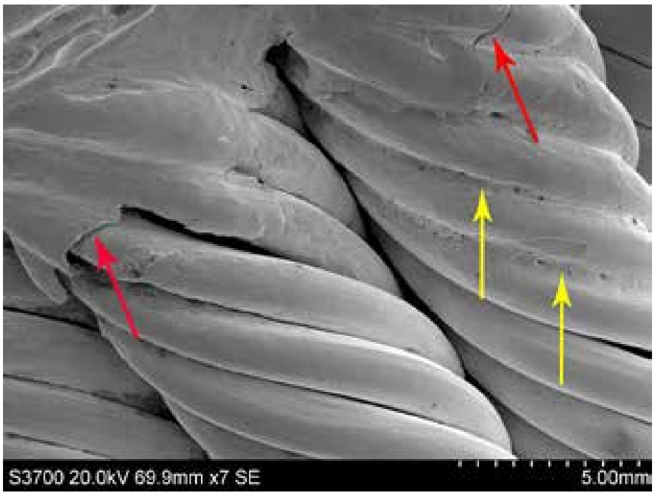
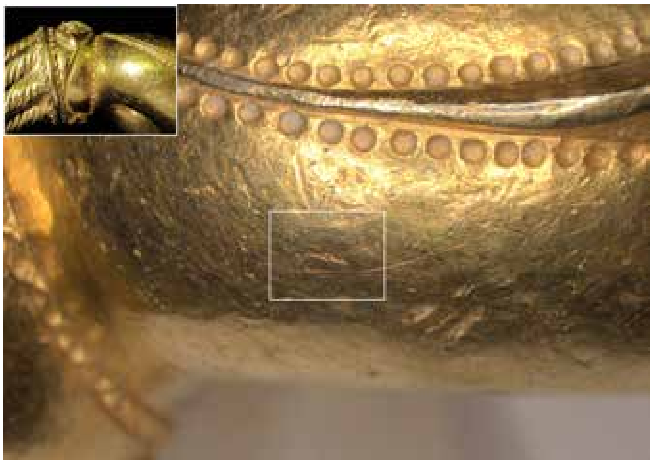


Figure 17.90 SEM SE image of the Great Torc terminal flange overlapping the wires, relatively thin metal at this point, and of the solder having run between some of the round-section wires (yellow arrows). Note how some wires have separated from the overlapping flange due to stress corrosion and fatigue cracking of the solder join and the wire (red arrows) similar to cracks in Figure 17.89



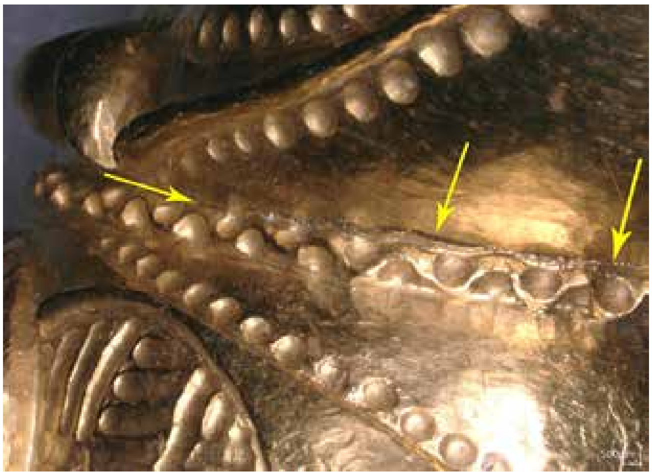
a

b

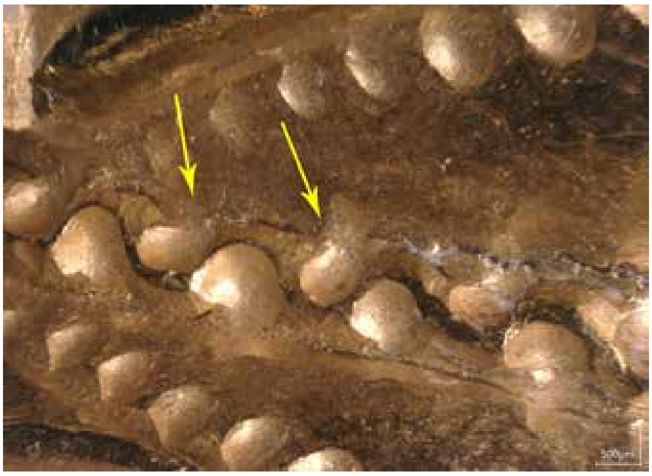
Figure 17.91a–b a) Great Torc terminal with the location of the casting defect on the side of the torus in the centre of the marked square (image width *c.* 35mm); b) Close-up of the same dendritic cold-shut casting defect. The solidity within the defect shows that it is not a crack from sheet-metalworking (x100. Note that the close-up image is rotated *c.* 90 degrees with respect to (a). Scale 200 µm (0.2mm), image width 2.5mm)

The oblique radiograph view of the Great Torc (**Figs 17.82, 17.85a–b**) shows a brighter, ring-shaped band at each end of the central eyes. The bands are brighter due to the X-rays having thicker metal to penetrate, indicating a region where gold alloy components are overlapping. The axial radiographs (**Figs 17.83–4**) clearly show the overlap between a concave tubular sheet core, which forms the terminal central hole, and the surrounding torus (cf. Machling and Williamson 2018 for the discussion on sheet core construction). The small sharp 'corners' (yellow arrows in **Figs 17.84**) indicate the edges of the underlying torus metal. Several small cuts on the edge of the toroidal terminal component are visible on an enhanced oblique view of this region of one terminal (yellow arrows in **Fig. 17.85a**); these would have allowed greater flexibility when inserting the core sheet for soldering into the torus to complete the terminal. The overlap has been disguised externally on the plainer reverse sides by burnishing the gold surface. On the more decorative front of the terminals, the join has also been hidden by adding a wavy strip of gold enhanced with a hemispherical punched design, presumably soldered on around the circumference of the hole (**Fig. 17.86**). Although largely hidden, some edges of the latter seam can be noticed on the magnified optical and SEM images (**Figs 17.87–8**).

The decorated collars of the terminals display a similar X-ray attenuation to the main toroidal metal and appear to be of similar thickness (**Fig. 17.85**). The 64 wires making up the neck-ring of the Great Torc appear to have flat ends, suggesting that they have been cut straight across after being twisted and curved into their final shape before the terminals were fitted (**Figs 17.82, 17.85**), as in the reconstruction of the Great Torc (p. 456; **Fig. 17.58**). The collar necks extend over these cut wires, forming a flange that is moulded and burnished over and between the 64



a



b

Figure 17.92a–b Great Torc terminal with a long shrinkage crack between the torus and neck showing the punched tool marks overlapping the shrinkage crack. b) Note the punched decorative hemispheres going over and closing the crack (yellow arrows) (a) x20, width of image 18mm, b) x50, width of image 7mm)

Figure 17.93 Detail of part of the long shrinkage crack in the Great Torc, showing depth and solidity of metal (x100, width of image 3.5mm)

wires of the neck-ring. This has created a solid-looking infill in some areas (**Fig. 17.89**), with associated dendritic microstructures in places, and more obvious overlapping thin metal in other areas (**Fig. 17.90**).

The appearance of once-molten metal around the join between the Great Torc terminal and neck-ring had been assumed to be evidence of casting-on (as reported in Joy 2015 and Meeks et al. 2014), but in fact further examination suggests that the appearance of the wire/terminal junctions on the Great Torc is very different to that of the cast-on terminals, on which the cooled metal appears globular (**Figs 17.64–6**). Instead, molten solder appears to have run between some of the wires and fused them together, suggesting in fact that the collar necks were soldered onto the neck-ring wires (**Figs 17.89–90**). Some wires and regions of thin neck metal have separated and cracked on one terminal, due to stress created by flexing and bending the torc during use. It is likely that, in these regions, the wire ends were originally probably not well supported or not fully soldered to the overlapping terminal flange (**Fig. 17.90**). The radiographs show no dense internal areas where the flange overlaps the wires, which suggests that there are no additional internal supporting metal components or rivets joining the terminals to the neck-ring.

While the radiographs show the internal structure of two overlapping components, the sheet core and the outer torus,

Figure 17.94a–b Grotesque Torc terminal with brittle cracks and missing metal/holes from work-hardened hammered sheet (x20, width of images 18mm). b) Note the thin metal and fracture along the bend line. These features are metallurgically very different from the cast defect seen on the Great Torc terminal torus in Figures 17.91–3

a

b

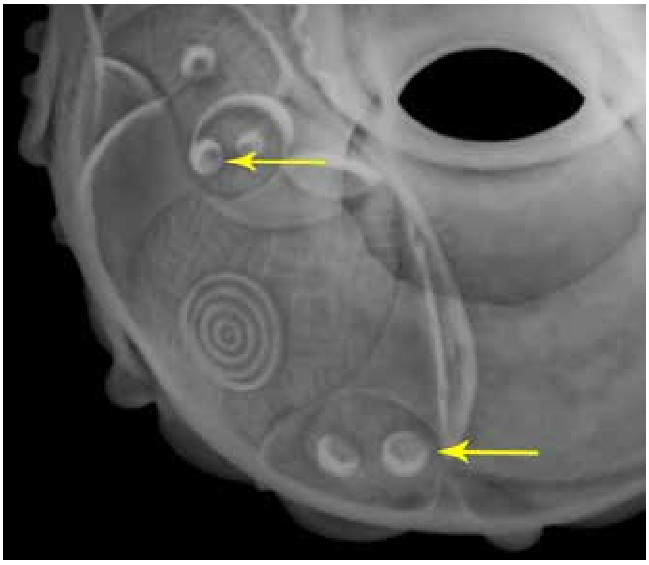


Figure 17.95 Enhanced X-radiograph (CR) detail of the Great Torc terminal showing the hollow spheres (yellow arrows) and apparently solid concentric rings

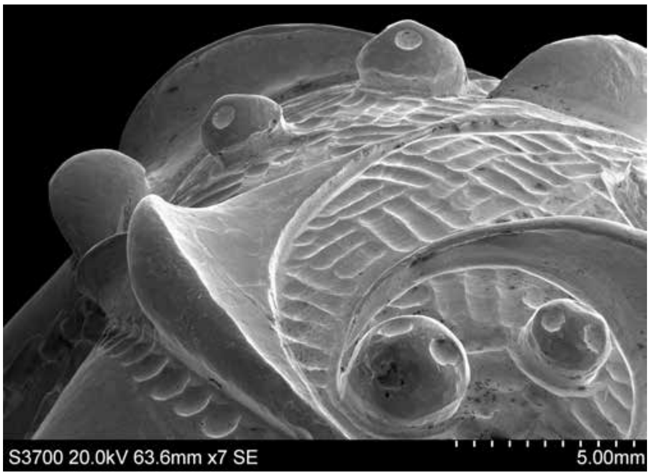


Figure 17.96 SEM SE image of the Great Torc terminal showing the highly three-dimensional decorative designs, engraving undercuts around features for emphasis, individual round punch-marks and the linear multiple-punch tracks forming the geometric hatched 'basket-weave' pattern

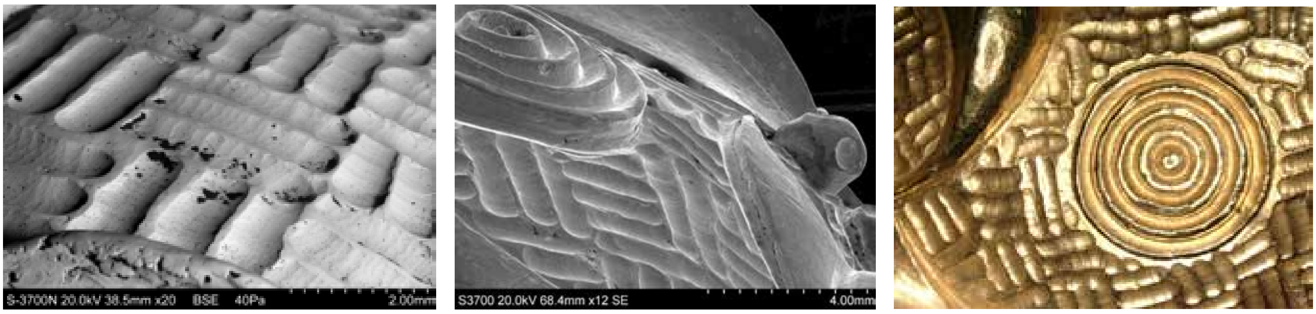
optical microscopy revealed a dendritic cold-shut casting defect on a smooth area of the outer surface of one terminal torus, away from the concave tubular core sheet (**Fig. 17.91**). Around this region are a few other similar defects, which confirm that the terminal torus was originally cast (Ott *et al.* 1985, 99: 'Figure 1 … typical crystallization voids of dendritic origin'). Additional evidence for casting is a long shrinkage crack found in the depression where the torus flares to become the collar (**Fig. 17.92**). The open collar would have been part of the original cast torus for the attachment and covering of the neck-ring wires. A close-up view of the deep crack shows the thickness of the gold at this point (**Fig. 17.93**). Clear punched hemispheres over the crack have sealed it (**Fig. 17.92b**, centre), indicating that the crack preceded the decorative punching and is not a post-depositional corrosion crack. These features are metallurgically different from hammered work-hardened cracking, which is often accompanied by loss of material and therefore holes in the gold sheet, as seen on the sheet terminals of the Grotesque Torc (see below and **Fig. 17.94**).

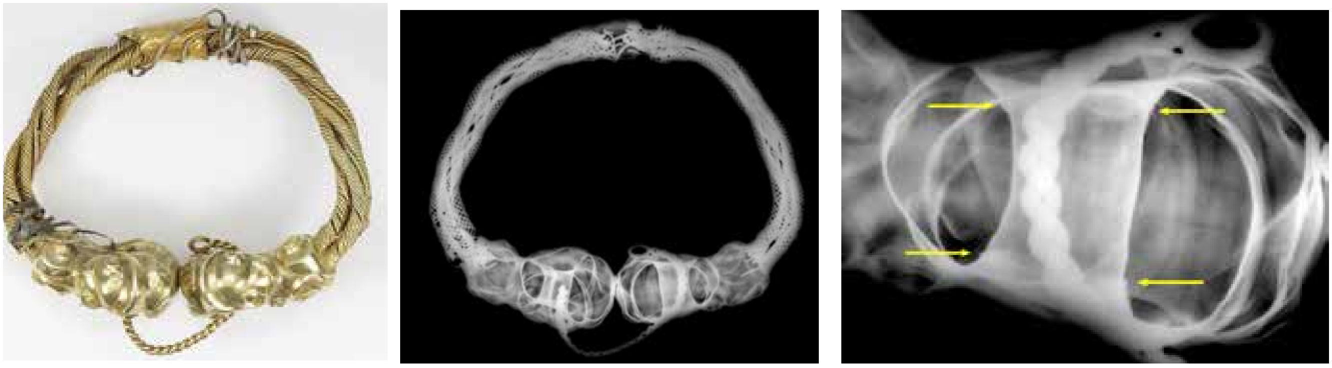
This evidence suggests that the toroidal terminals of the Great Torc were originally formed as open castings (e.g. see L.21; **Fig. 17.64**), with all the deep three-dimensional decorative design elements being cast to shape with the metal of the terminal. To facilitate the accurate positioning of the design elements, it is suggested that all the main design features could have been located on an accurately prepared clay core over which wax was then modelled to refine the decoration, such as the solid concentric circles, hollow waves and spheres (**Figs 17.95–7**), which were then cast in gold once the clay moulding process was completed. Despite the torus and collar being cast, no evidence of chaplets was found. However, these could have easily been removed before closing the torus. Alternatively, a very simple solution would be for the clay cores to simply extend up through what would become the open collar, where they could join directly with the applied external clay mould and become one complete moulded unit, and therefore be self-supporting.

The open torus and collar would have allowed easy access for finishing tools after casting, for example for carrying out repoussé of the hollow waves and spheres (*c.* 2.2–3.3mm diameter) (**Figs 17.95–7**). These highly three-dimensional hollow motifs may even have been additionally punched into moulds to fully define their shape. Internal support tools and materials could also have been inserted into the open casting for chasing and punching decoration from the front and for fine planishing (flattening of the surface with a smooth-faced hammer). Filling the terminals with a supporting material during final punching and chasing to refine the decoration would have avoided any

Figure 17.97a–c SEM a) BSE and b) SE images and c) photomicrograph (x20, width of view *c.* 10mm) of the concentric ring decoration on the Great Torc terminal. Note the height difference between the high three-dimensional features and the lower 'basket-weave' hatching

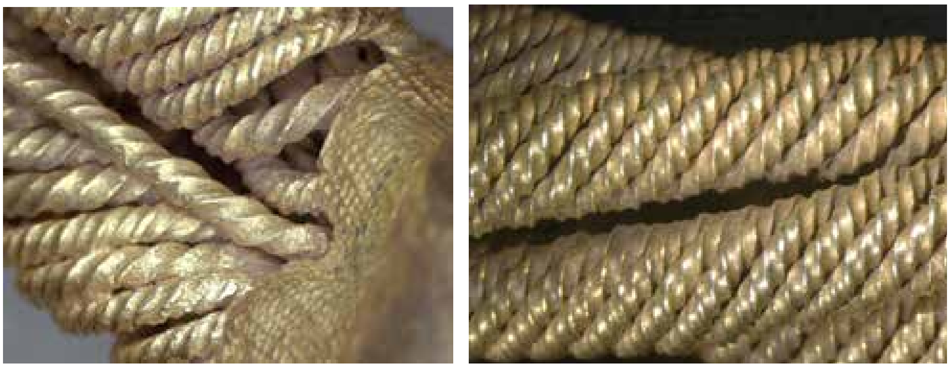
a b c





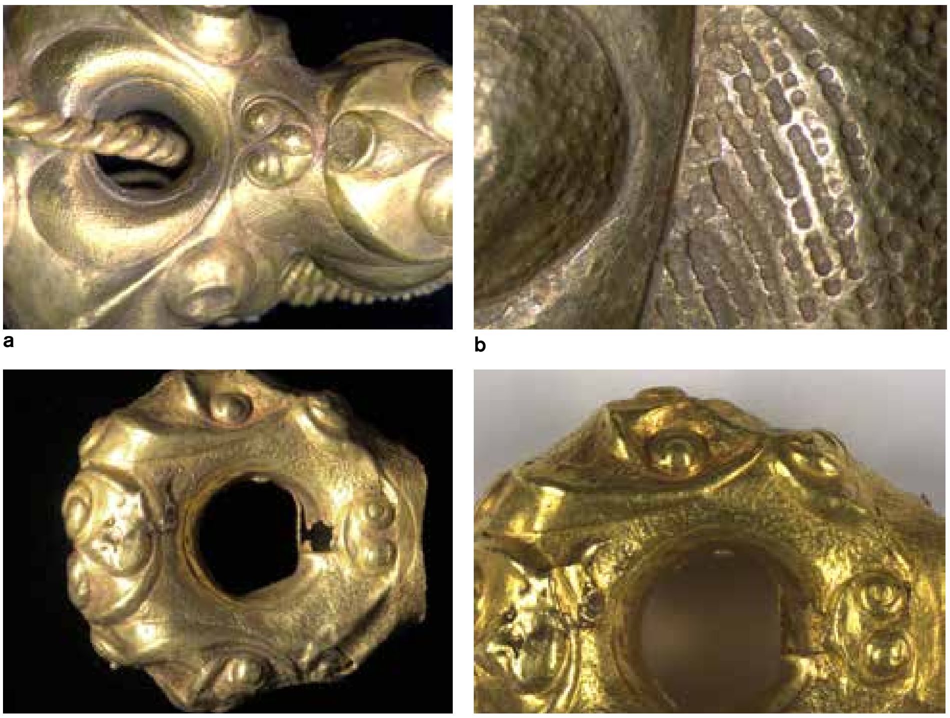
a b c

Figure 17.98a–c a) The Grotesque Torc (L.19) (210mm maximum external diameter); (b) X-radiograph (CR) showing the ancient repair of the broken wire neck-ring using sheet gold wrapping (radiograph: D. O'Flynn); (c) X-radiograph (CR) detail of the Grotesque Torc left terminal, with yellow arrows indicating the overlap and discontinuities between the concave tubular sheet creating the hollow core and the toroidal sheet of the terminal



a b

Figure 17.99a–b a) Grotesque Torc terminal collar flange of thin sheet gold with dot-punched decoration, where it covers the twisted square section wires of the neck-ring. There is evidence of some solder on and between the wire ends (width of image *c.* 20mm); b) Uniformity of twisted square section wires (width of image *c.* 30mm)



a b c d

Figure 17.100a–d Top (a–b): Grotesque Torc terminal, with deep, rounded decorative features shaped by repoussé, and outlined by chasing and areas infilled with closely spaced linear dot-punched decoration (left image width *c.* 70mm); Bottom (c–d): sheet torc terminal F.72 with areas between repoussé designs infilled with random multiple-punch stippling using a single round-ended tool

unwanted indentation or deformation of the thin metal around the tool marks. Engraved lines can be clearly seen at the base of most decoration in relief: they appear to be cut relatively deep into the metal (**Figs 17.96–7**). This suggests that the metal was significantly thicker at the base of these decorated areas to allow for the amount of engraving, undercutting and deep chasing observed on these terminals (**Figs 17.96–7**).

Once the decoration of the terminals had been completed, the eyes of the toroid components were closed by overlapping the concave tubular core sheet with the edges of the cast torus. The terminals were then soldered in place on the ends of the neck-ring, the resulting join being burnished and polished between and over the wires (**Figs 17.89a**, **17.90**).

The complexity of the construction and attachment of the Great Torc terminals thus appears unique, combining

elements of both sheet working (as theorised by Machling and Williamson, 2016 and 2018) and cast construction (as originally believed and reported in Joy 2015 and Meeks *et al.* 2014).

Sheet terminal manufacture case studies: The Grotesque Torc (L.19a) and F.72

Radiography of the so-called Grotesque Torc (L.19, **Fig. 17.98**) has shown evidence of an overlapped concave tubular core sheet on the terminals, similar to that seen on the Great Torc (Machling and Williamson 2018). In this case, however, there is no evidence that any of the components were cast, and the terminals seem to be constructed entirely from hand-worked gold sheet. The terminal flanges are moulded over the composite wires and appear to be soldered to them, but not very securely (**Fig. 17.99**). The relief designs have a 'softer', more rounded and less angular decoration (**Fig. 17.100**), as would be expected from a design created by repoussé and not necessarily punched into dies. This torc and another similar sheet terminal torc (F.72) also have a completely different punched stippling infill decoration within the design elements (Ch. 21; **Fig. 17.100**).

Comparing different forms of multi-strand torc construction

It is instructive to use X-radiography to compare the construction routes of four of the most impressive and well-known Iron Age gold alloy torcs: the Great and Grotesque Torcs from Snettisham, the Sedgeford Torc (discussed extensively above) and a similar example discovered at Newark, Nottinghamshire, in 2005, and subsequently subject to a Treasure Inquest. There are a number of similarities between these pieces, but close analysis suggests a wide range of terminal production routes.

Figure 17.101 compares the X-radiographs of three terminals with different construction routes (a separately cast and mechanically attached terminal from the Sedgeford Torc, a sheet terminal of the Grotesque Torc, and a composite Great Torc terminal with both cast and sheet elements; see pp. 464–6). Moving from left to right, each row of images shows the effects of increasing the tube voltage (and so, the mean and maximum X-ray energies), resulting in increased penetration of the X-rays. Internal structures appear much better defined at the highest voltage, and the relative gold thicknesses of the different terminals can be distinguished. The sheet gold terminals of the Grotesque Torc show the most detail at all voltage settings, indicating that it is made of the thinnest gold. In contrast, the terminals of the Sedgeford Torc (**Fig. 17.70**) appear less well defined on radiographs acquired under the same exposure conditions (**Figs 17.71–3, 17.101**). They show blurred edges due to the thicker metal contributing more towards X-ray scatter (**Figs 17.71–3**).

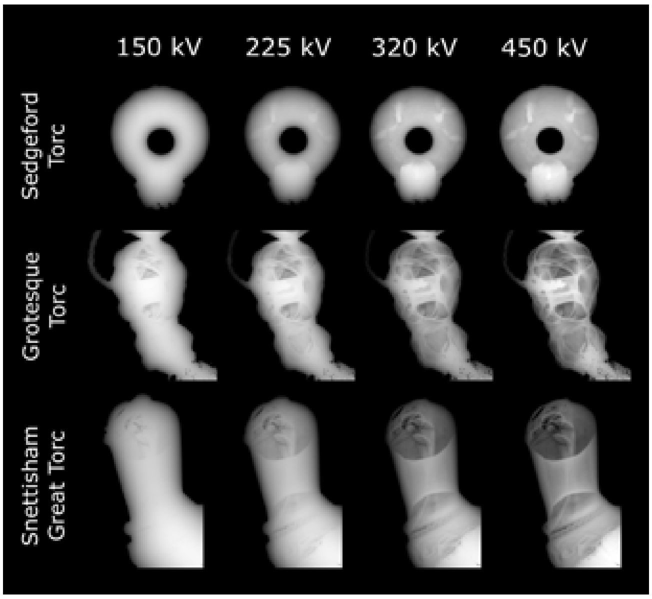


Figure 17.101 X-radiographs (CR) comparing terminals of the Sedgeford Torc (BM 2005,1103.1), the Grotesque Torc (L.19) and the Great Torc (E.1a) and showing the effects of increasing the voltage, which results in increased penetration of the X-rays in the gold

Table 17.8 Construction summary for the Great Torc and Grotesque Torc from Snettisham, and the torcs from Newark (Nottinghamshire) and Sedgeford (Norfolk). MSCC: Multi-strand Construction Code, see typology in Chapter 13

Torc	Terminal construction method	Terminal attachment to neck-ring	MSCC	Neck-ring description
Great	Composite: cast and sheet elements	Soldering	(8C(8C))R	Stage III neck-ring formed from eight ropes coiled together around a hollow core, each rope made up of eight coiled circular-section wires
Grotesque	Sheet	Soldering	(4C(4C))T	Stage III neck-ring formed from four ropes coiled together around a hollow core, ropes made up of four coiled strands of square-section twisted wire
Newark	Cast(?)	?	(8C(4P))R	Stage III neck-ring formed from eight ropes coiled together around a hollow core, each rope made up of four circular-section wires plied together
Sedgeford	Cast	Mechanical. Rivets secure the internal tubular cap (containing the soldered ends of the neck-ring wires) to the terminal	(8C(3P))R	Stage III neck-ring formed from eight ropes coiled together around a hollow core, each rope made up of three circular-section wires plied together

Figure 17.102 Iron Age gold torc from Newark, Nottinghamshire

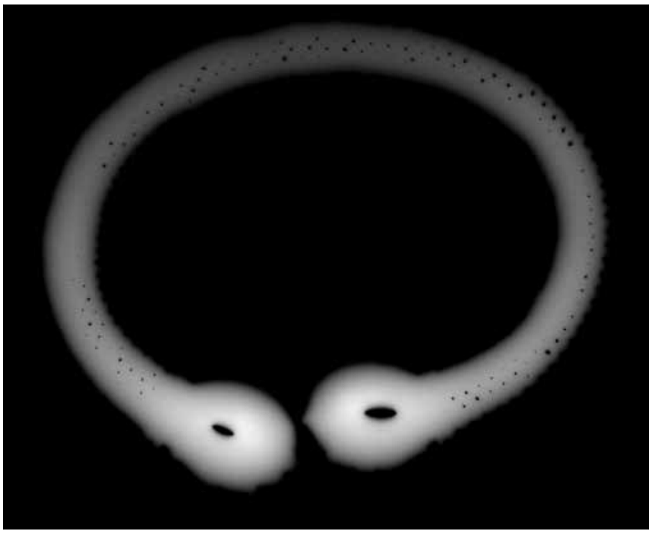


Figure 17.103 Film X-radiograph from archive material of the Newark Torc, acquired in 2008 during an earlier examination of this Treasure find at 150 kV, 5 mA and 5 minutes exposure time (radiograph: J. Ambers)

The use of a range of X-ray tube voltages (**Fig. 17.101**) also enabled comparison with an existing X-radiograph of the Newark Torc from Nottinghamshire (**Fig. 17.102**), which was taken as part of an earlier Treasure investigation (Hill in Hitchcock 2006, 55) (**Fig. 17.103**). The density of the Newark Torc terminals suggests a thickness more similar to the cast Sedgeford Torc terminals, than the sheet terminals of the Grotesque Torc (**Fig. 17.101**).

The three torc terminals shown in **Figure 17.101** were produced in very different ways, although connections can also be charted between them (see summaries in **Table 17.8**). The Sedgeford Torc terminals are closed-torus hollow castings with chaplets and what appears to be thicker metal on the radiographs. The Grotesque Torc and Great Torc terminals were both made from two main components: a relatively thin gold open torus (thinner for the Grotesque Torc and thicker for the deeply embossed Great Torc) and a concave tubular sheet core, which was soldered in place to close the eye of the terminal, burnished and the joins concealed. This core feature appears similar to that of the Netherurd terminal from Peeblesshire (described by Machling and Williamson 2016; 2018), which also shares the concentric circular decorative elements seen on the Great Torc (**Figs 17.81, 17.97**). Whilst the Grotesque Torc terminal components all appear to be made from sheet, a casting defect on one of the Great Torc terminals and shrinkage cracks in high-stress regions of the neck-flange confirm that the open torus elements of the Great Torc terminals were cast.

Evidence provided by the manufacturing techniques of the Great and Sedgeford torcs suggests that casting high-profile decorative terminals was a well-established metalsmithing technique. While successful in some cases, many castings suffered cold-shut surface defects. This could be due to the metal cooling prematurely or an air lock preventing full metal flow within the mould (e.g. L.21, **Fig. 17.68**). The Great Torc shows a similar small dendritic casting defect on the surface of one terminal (**Fig. 17.91**). The Sedgeford Torc terminals are excellent examples of cast terminals with perfectly formed three-dimensional motifs and largely without defects, apart from a crack on the back of one terminal which appears to have been repaired with rivets and concealed at the time of manufacture (**Fig. 17.74**).

All three sets of torc terminals seen in **Figure 17.101** were made as separate components from their wire neck-rings (**Table 17.8**). They have not been cast directly onto the wires, as previously hypothesised for the Great Torc and as is the case for most torus, reel and buffer terminal torcs from Snettisham. On the Great Torc and Grotesque Torc, the terminal collars were fitted over the completed wire neck-rings, the edges moulded over the wires, burnished and soldered in place. The cast terminals of the Sedgeford Torc were mechanically secured in place with rivets, fixed onto

Figure 17.104a–c a) Cast buffer terminal (24mm diameter) from Snettisham (L.13) showing linear post-casting punch tool mark 'basket-weave' hatched decoration similar to the Great Torc (see Figs 17.96–7); b) Engraved outlines of the design elements. c) Note that some of the wire ends passing into the edge of the cast-on terminal are square – presumably unfinished ends of the original hammered wire. Note the decorative edge dot decoration

a

b

c

a

b

Figure 17.105a–b Cast a) Sedgeford, and b) Newark terminals with geometric, basket-weave pattern similar to that on the Great Torc and the cast buffer terminal torc L.13 (Fig. 17.104). This decoration on the Sedgeford and Newark terminals is less well defined than on the latter two torcs

metal tubes which had been soldered onto the ends of the neck-ring wires.

The Great Torc terminals appear to be the most elaborately decorated large terminals from the Snettisham hoards with very well-defined and highly three-dimensional decorative designs and detailed finishing. These decorative motifs are similar to those on the terminals of the Sedgeford Torc as well as Snettisham torcs with cast-on terminals (e.g. **Figs 17.67–8**). Both the Great and Sedgeford torcs also have detailed external tooling to define their decoration. The strong stylistic association between the Great Torc terminals and other cast terminals suggests a probable metalsmithing connection.

Despite sharing one common technological feature (the presence of a tubular sheet core in the centre of their terminals), the Great Torc and Grotesque Torc contrast stylistically: their decoration is very different, as are the type and arrangement of neck-ring wires: the highly twisted square-section wires of the Grotesque Torc (**Fig. 17.99**) contrast with the smooth circular-section wires of the Great (**Fig. 17.90**), Sedgeford (**Figs 17.74–5**) and Newark torcs (**Fig. 17.102**). The latter three all have Stage III coiled constructions comprising eight coiled or plied ropes made from circular section, while the Grotesque Torc has a neck-ring consisting of just four ropes made up of twisted wires (**Table 17.8**).

In addition to similarities in their neck-ring structures, the Great Torc also has far more in common in the design and shape of its three-dimensional decorative motifs with the torcs from Sedgeford (**Fig. 17.70**), Newark (**Fig. 17.102**), and Netherurd (**Fig. 17.81**). The punched infill decoration of the Grotesque Torc contrasts with the punched geometric, basket weave textured pattern of the Great Torc (**Figs 17.96–7**), which is very similar to that of a cast buffer terminal torc from Snettisham (L.13; **Fig. 17.104**). The tool marks on the Great Torc and L.13 suggest the use of a gently hammered chasing tool with a rounded tip used to create the hatched 'basket-weave' patterns, instead of using a single textured punch, and with the design elements outlined by engraved lines. This pattern is also seen on both the Sedgeford and Newark torcs, which display areas of similar design, although smaller and less well defined (**Fig. 17.105**).

Some of the differences between the Grotesque Torc and the Great, Sedgeford and Newark torcs are most likely due to chronology. On stylistic grounds, the Grotesque Torc, with its 'Plastic Style' decoration (see Ch. 21), is considered to have been manufactured earlier, and may be one of the oldest objects from Snettisham (Chs 20, 21). The similar sheet terminal, F.72, may be of similar date. The 'Style V' designs and hatched 'basket-weave' infill seen on many of the Snettisham torcs (including the Great Torc and L.13) as well as Sedgeford and Newark are likely later, although they cannot be closely dated (Ch. 21). The likely difference in age between the Great and Grotesque torcs suggests that the technology of closing a torus terminal with a sheet core (noted here and by Machling and Williamson e.g. 2016; 2018) was a long-lived and perhaps widespread technique, even though today it is preserved in only a relatively few objects.

Although bearing similar decorative styles, surface finishing and tool marks, the terminals of the Sedgeford Torc and the Great Torc have been produced using two different but complementary technologies, respectively lost-wax casting only for the former and casting with additional sheet working for the latter. The sheer range of construction techniques seen across the pieces discussed here shows the incredible creativity and diversity at play in goldsmithing traditions evident across Britain at the close of the Iron Age.

17.7 Discussion and conclusions

The technological study of the surfaces and structures of components and alloys of the Snettisham hoard objects has identified and recorded the wide range of metalsmithing skills and production processes used to manufacture the components for the torcs and their assembly, as well as the highly skilled decorative and finishing techniques used to embellish the finished products.

The archaeometric study of this unique assemblage has provided many new insights into Iron Age metalworking technologies. At least four groups of alloys have been identified:

- High gold-silver with low copper alloys (used in both wires and sheet objects)
- Silver-gold-copper alloys (wires)
- High-copper and low-gold silver alloys (wires)
- Bronzes (wires)

The selection of alloys for particular purposes may have been based on their metallurgical properties as much as, or perhaps more than, other criteria such as colour. The analytical data show the use of purer gold for sheet components; these high-gold alloys may have been selected for their malleability and ductility, as it is easier to hammer

sheet from high-gold alloys. Many torc wires, in contrast, are made of high-copper / low-gold silver alloys which cluster in the area of the gold-silver-copper ternary diagram with the lowest melting points. Their low melting temperature ranges may have been of more importance to the metalsmiths than the primary alloy colour by way of making the production of the metal easier and more energy efficient. It must have been known to the metalsmiths that mixtures of gold, silver and copper in this range of proportions needed less heat and likely less fuel to melt. This was perhaps a more important practical consideration in the production process than colour, since they knew that the final colour of the torcs would change to a more gold/silvery colour during manufacture and also that the final objects would also be more resistant to corrosive effects in general, and be less susceptible to cause copper-colour skin staining when wearing. In addition, the initial alloy being richer in copper would save on the overall quantity of gold used without impacting on the final surface colour of the surface-enriched torcs.

Wires and sheets of a wide range of gold-silver-copper alloys were hand worked by hammering, quenching and annealing/pickling in mildly acidic medium. Experimental reconstruction of wires by practising metalsmith John Fenn has suggested a likely route for the production of the range of types and diameters seen at Snettisham, based on the hammering out of a square-section ingot or rod. Whilst it was relatively quick to produce wire in this way, the experimental work emphasised the great skill needed to produce wire of a uniform diameter.

A wide range of alloy colours are present at Snettisham, spanning from a pale whitish silver to yellow-gold. At least three different processes revealed through analytical work on the Snettisham material affected the final surface composition (and hence colour) of the objects:

- Surface enrichment of gold/silver through the cycles of hammering, annealing and pickling that were used to shape both wires and sheet elements
- The use of a salt parting-like process perhaps related to gold-refining techniques
- Mercury gilding

In the case of surface enrichment due to hammering and pickling, especially notable in the lower-gold alloys used for many wires, the alloy composition at the surface was modified by depleting the copper content and thus enriching the proportions of gold and/or silver. The resulting shift to a whiter colour may have been an expected but largely unintentional or at least unavoidable, yet a beneficial and exploitable result of the wire-making processes. However, some of the objects studied (especially high-gold alloy sheet objects) also showed variable but significantly reduced silver concentrations at the surface with, in some cases, losses of at least one third of the silver. While the removal of copper from the surface of a gold-silver-copper alloy could be achieved by oxidation and pickling, this would have only a minor effect on the silver content, suggesting that in some cases the goldsmiths making the gold sheet objects used technologies more akin to gold-refining processes. The colour shift here would, however, have been subtle, all taking place within the yellow-gold range, and thus it is possible that, if surface enrichment was an intended outcome, it was concerned as much with the durability and corrosion-resistance of the finished product as with the colour. The clearest evidence for deliberate control of surface colour and texture comes in the form of gilding. Several silver-copper and bronze wires have been shown to be mercury gilded, the earliest use of this technique in Britain so far documented. Overall, the techniques observed suggest a preference for colours ranging from white, through pale greenish gold to yellow-gold, with perhaps some avoidance of more reddish/copper-coloured ternary alloys, though of course bronze objects appear in most of the hoards. The presence of gilded objects, however, does suggest that yellow-gold was highly valued amongst the available range of colours.

The question of sources of gold for these artefacts remains difficult to answer with any certainty, but Northover (1995a) makes the interesting observation about Britain that 'gold disappears from the archaeological record at or about the end of the 8th century B.C. and does not reappear until the arrival of the first imported Celtic gold coins in the late 3rd or 2nd century B.C.'. There is a probable link to continental goldsmiths producing tubular torcs and if there was paucity of native gold in Britain (or the knowledge of where and how to access it), it could be suggested that the gold for the main bulk of the Snettisham torcs and fragments might also have come from the continent, possibly in the form of coinage which was recycled to make torcs (see Ch. 23; discussion in Sharples 2010, 146–59; La Niece *et al.* 2018). Ancient European sources of gold are many and widespread and are reviewed by Lehrberger (1995).

Both wire and sheet elements were employed in the manufacture of multi-strand and tubular torcs. The range of objects and techniques at the site is extraordinary, with an incredible degree of variation on certain standard elements of torc construction. Tubular torcs were generally constructed from high-gold alloy sheets, and most are composite objects constructed from multiple components soldered or mechanically attached together. The large (Type 6) tubular torcs from Hoard A are very complex, with sheet gold elements combined with iron cores, stabilised by a sandy filler. In most cases the terminals are separate components, often with decorative elements, some comprising beaded wire and filigree, with tooled decoration including both simple punch-marks and high-relief repoussé designs. Other tubular torcs also exhibit multi-component construction and relief decoration embellished with punching and chasing.

Multi-strand torcs from the site also exhibit great diversity, with wire neck-rings in a range of alloys, types and sizes. Simple wires in a variety of thicknesses were combined in inventive ways to create complicated neck-rings. Sometimes wires were plied/twisted directly together, and in other cases they were coiled around a core made of flexible wood or another material to facilitate accurate bending and prevent collapse of the coiled 'ropes'. These core supports were probably removed before the terminals were cast on, having served their purpose, except for the small bronze torcs where charred wooden core remains are found (see Ch. 19). The simplest multi-strand neck-rings are made from a pair of wires plied together or a single coiled

'rope', but many torcs combined these elements in multiple stages to produce effects resembling cables or braids. Terminals are just as diverse, ranging from simple loops made from the ends of the neck-ring wires, to solid cast-on buffer and torus terminals, right through to complex composite terminals with both cast and sheet elements. Some cast terminals had high-relief motifs incorporated into their designs, and surface decoration such as repoussé/chasing, punching and engraving were used to embellish the most ornate examples.

Neck-ring and terminal types were combined in a remarkable and exceptional number of variations, with many torcs from the site being unique, or at least having some small detail which marked them out from others, whether in terms of neck-ring construction, a terminal design choice, or some unusual combination of the two elements. The range of techniques used suggests a rich and varied metalworking tradition in the region, even if the precise location of manufacture remains unknown, with long-lived techniques perhaps persisting over centuries. The variety of colours, designs and styles of torcs speaks to the incredible skill of their makers, and hints at the desire to make these objects highly recognisable to those who wore and encountered them.

17.8 Appendix on scientific methods

The Department of Scientific Research at The British Museum has a comprehensive range of scientific equipment that was used to study the Snettisham Hoards. The techniques used are listed below with details of their operating parameters.

From the wide range of torcs, wire components and fragments of gold/silver and bronze alloys and organic materials in the Snettisham collection, representative examples of most types were examined and analysed by a comprehensive range of scientific instrumentation to provide visual, analytical and technological evidence of the sophisticated metalworking traditions and practices, alloy compositions and surface enrichment processes used by the Iron Age metalsmiths.

Scientific instrumentation:

- Microscopy: Optical microscopy (OM) – three types: binocular, digital and inverted stage metallographic microscopy
- Scanning Electron Microscopy with Energy Dispersive X-ray microanalysis (SEM-EDX)
- X-radiography
- X-ray fluorescence analysis (XRF)

Microscopy

In order to fully characterise the range of objects and fragments from Snettisham, from the largest torcs to the smallest wire, complementary microscopy techniques were used, as well as macro-photography of the objects, therefore covering the full range of visualisation of the objects and their components and structures. A combination of optical microscopy techniques (OM) (with a range of magnifications - 6x to 200x), and analytical scanning electron microscopy imaging (SEM-EDX) across a wide magnification range -10x to 3000x for routine examination, and up to 20,000x for specialised examination - were used. OM and SEM imaging of samples provided microstructural information about the mechanical working and thermal treatment of the metal, while the elemental analysis allowed the investigation of surface treatments by identifying variation in compositions between core metal and surface.

Scale measurements on micrographs have the notation of '**µ**m' ('micrometre' sometimes referred to as 'micron'). 1000 µm = 1 mm (millimetre).

Optical microscopy (OM)

Conventional binocular optical microscopy was used extensively to examine the whole objects at low magnification to study the physical form of the torcs, their components, construction methods, tool marks, decoration and wear patterns as well as allowing comparison of their relative colours. The stereo vision that this gives is essential for fully understanding the objects' form and intricacies (Leica MZ stereo zoom binocular microscope, 6 – 60x magnification).

Digital optical microscopy

Digital optical microscopy is a variation of zoom optical microscopy but the object image is displayed on a high resolution screen. A new fully digital optical microscopy

system was introduced to record images digitally and at very high resolution (maximum resolution 4800 x 3600 pixels). The instrument used was a Keyence digital microscope VHX-5000 with a VH-Z 20R lens, a range of magnification between 20 and 200x, an automated stage VHX-S 550E and LED reflected illumination). The digital optical microscope has no conventional eyepiece lenses for observing the objects in detail, but instead it has a high-resolution camera on the microscope body with its objective zoom lens and mounted on a stable platform with a motorised X-Y stage movement to accurately track across the object. The images are displayed on a high-resolution monitor. The digital system allows multiple users to examine the object at the same time.

Metallographic optical microscopy

For optical microscopy of polished resin mounted samples of wires etc. an inverted stage metallographic microscope with dark field illumination was used to examine the metallography of prepared polished samples (see p. 424). Dark field illumination is a combination of a low angle raking light and a specific type of lens system which highlights grain boundaries and displays regions of corrosion from burial in bright colours without specular light reflection. This allowed observation of the etched metal microstructures that retain evidence of the last mechanical and heating processes applied to the metal during fabrication, by highlighting the grain structure, size and deformation, and the compositional distribution within grains and dendrites (coring), showing the extent of working. Information about whether the metal is cast, mechanically worked (hammered), annealed and deformed after annealing is thereby revealed, giving the technological history of the object. Surface-enriched layers are seen in their different colours relative to the core metals. The instrument used was a Zeiss Axiovert 100 Inverted Microscope connected to a digital camera for image capture at magnification of 25x to above 1000x.

Scanning Electron Microscopy with energy dispersive X-ray microanalysis (SEM-EDX)

SEM examination was carried out in three different instruments. A high vacuum analytical SEM (JEOL JSM840), a large chamber Variable Pressure (VP) SEM (Hitachi S-3700N), and an ultra-high-resolution Field Emission SEM (Hitachi S-4800 FESEM). All were equipped with energy dispersive X-ray microanalysis (SEM-EDX): Oxford Instruments ISIS™ analyser on the former and Oxford Instruments NanoAnalysis INCA™ and AZtec™ analytical systems on the latter two. These were used for detailed study directly on the object surfaces and of polished cross-sections prepared from representative metal samples taken from damaged fragments. Imaging techniques used low energy secondary electron (SE) and high energy backscattered electron (BSE) detectors. The different detectors give complementary information about the surface topography and composition of the objects and samples respectively. SE imaging gives a more 'naturalistic' view similar to a black and white photograph of an object under idealised illumination. BSE images provide two types of information: first, a very clinical view of 3D object surfaces, due to the directionality of the electrons creating high contrast and shadowing; and second, very important chemical information. The latter is due to the different relative reflectivity of the focused electron beam from areas of different alloy compositions or other material phases within the polished sample surface. This creates different shades of grey, caused by the mean atomic number (mass) distribution within the sample material and is very effective in promoting microstructural observation of different alloy phases, as well as alloy diffusion and homogeneity. Therefore, as well as high contrast structural images that are essential when observing and interpreting the polished cross-sections of wires, they show the complex interaction zones and changes in composition at the surfaces of the wires that are key to understanding the manufacturing processes involved in surface enrichment.

SEM Variable Pressure operating conditions were typically 30 Pa pressure and 20 kV accelerating voltage. The sample stage for the Hitachi SEM allowed an area of 200mm diameter to be covered and was just large enough to accommodate large torcs, including The Great Torc. Working distances varied according to the types of images required, object sizes and heights, but for EDX analysis of polished cross-sections, the working distance was the standard 10mm.

Analysis of the elemental X-ray spectra, produced by the irradiation of the incident electron beam on the object or sample, is a fundamental technique for obtaining quantitative and qualitative compositional analyses and elemental distribution maps across polished samples. The EDX analytical conditions were 20 kV, a high-count rate of *c.* 10,000 counts per second (cps) at 30–35% dead time and acquisition time of 200 seconds. This gave the most efficient count rates and good counting statistics with consistent reproducibility. All elemental concentrations are given in weight percent (wt%). Precision and accuracy were assessed, and standardisation of this instrument carried out using a standard alloy of composition 50 wt% gold, 30 wt% silver and 20 wt% copper. The detection limits vary between elements and are determined by the physics of X-ray generation; they are typically 0.1–0.3 wt%. Measured standard errors of analysed elements (Au, Ag, Cu) of individual spectra are typically within +/- 0.18 wt% for major and minor elements in the alloys.

For the purpose of SEM-EDX microscopy and quantitative microanalysis, the polished samples were coated with a very thin layer of evaporated carbon to make the resin mounts conductive in the electron beam during observation in the SEM at high vacuum. VP mode was not used in the case of quantitative microanalysis, because the very low-pressure air used in this mode could cause a little scatter of the electron beam (skirting) around the targeted area of the sample and cause a small contribution from the surrounding area to be incorporated into the area being analysed.

Macro photography

Macro photography was also essential to record the physical structures, intricate designs and goldsmithing techniques and the condition of the metalwork prior to binocular microscopy examination and then high-resolution detailed study and analysis by SEM.

X-radiography

In 2017, the Department of Scientific Research at the British Museum acquired a high-power X-ray imaging installation (YXLON Access Y.100, equipped with a Y.TU450-D11 X-ray tube) that was used to investigate some of the larger hollow Snettisham and other torc terminals (see pp. 462–72). The high density of gold alloys and thickness of some terminals required the use of high energy X-rays to successfully penetrate the metal and obtain a clear image of the internal structure.

Two radiographic techniques were used to image the torcs: digital radiography (DR) and computed radiography (CR).

With DR, radiographs are recorded on a pixellated digital detector (in this case, a PerkinElmer XRD 1621 AN15 ES flat panel detector), giving images in real-time. A key advantage of DR is the ability to instantaneously see the effects of adjustments to the imaging parameters (e.g. X-ray tube voltage and current) on the image contrast, such that the maximum information can be extracted from particularly dense or thick objects. DR also provides the ability to quickly acquire a series of images of an object whilst it is rotated in sequential steps on a motorised turntable. This method allows the separation and identification of constructional and decorative features of the object, both external and internal which may otherwise be obscured or difficult to interpret in a single radiograph: for example, overlapping features at different object depths, including decoration at the front and back of the object, which may become foreshortened due to object orientation. In addition, these sequential images can also be run as a 'movie' that is a valuable aid to the interpretation of complex 3D objects.

With CR the radiograph is recorded on a plate (typically with a layer of photostimulable phosphor) which is subsequently digitised by scanning with laser light. Two archival X-radiographs recorded on film are also included in this chapter and are referred to as 'film X-radiographs'.

DR and CR were carried out on selected objects, notably the so-called 'Great Torc' (E.1a), and 'Grotesque Torc' (L.19). In addition, the torc from Sedgeford, Norfolk (1968,1004.1; 2005,1103.1), which is broadly contemporary with the items from Snettisham, was also examined using this technique as a useful comparison in terms of manufacturing technology. Radiography was conducted up to the maximum X-ray tube voltage of 450 kV and beam current of 1.55 mA, with a focal spot selection of 0.4mm. Images were integrated over 75 frames of 500 ms each (total exposure time of 37.5 seconds). The X-ray beam was pre-filtered with 3.3mm brass in order to remove the lower energy photons from the spectrum; low energy X-rays would not penetrate the torcs, but are likely to be scattered by them, affecting image quality. The Great Torc was mounted at an angle inside a foam mount for an optimum viewing orientation given its structure. The Sedgeford Torc and its detached terminal were mounted such that the terminals were upright.

X-ray fluorescence (XRF)

With the large number of objects in the Snettisham treasure, one of the first objectives was to identify the range of metal alloys in the collection and to focus on the more complete torcs. The preferred technique for such initial surveys is non-invasive analysis using X-ray fluorescence (XRF) in which a fine X-ray beam is directed at the surface of the metal to reflect back the signature spectrum of the elements, allowing identification of the surface metal alloys. The initial results obtained from these non-invasive analyses were useful although limited: a wide range of gold/silver/copper alloys and bronze were identified, but due to potential surface effects, such as deliberate treatment during manufacture and corrosion, surface analysis may not fully reflect the core metal. However, XRF pointed the way for sample selection for microscopy and SEM-EDX to fully characterise the alloys. XRF also identified the presence of mercury gilding on some fragmentary small bronze bracelets/torcs.

Chapter 18
Compositional Analysis of Objects from Snettisham Hoards A, B and C in the Collections of Norwich Castle Museum

Peter Northover

This chapter describes the metallurgy of the copper-based alloys at Snettisham and their metallurgical context in Late Iron Age Britain. The work presented here draws on a programme of analytical work carried out on Hoards A, B, C, and assorted stray finds from the 1960s and 70s which are held at Norwich Castle Museum. This work was begun in 1986–7, at the instigation of the then curator, Ms E.B. Green, with the aim of sampling every identifiable object but, not, of course, every single fragment. Approximately 165 samples from the collections of Norwich Castle Museum were examined by electron probe microanalysis and optical metallography by Ms E.C. Stone for her thesis for Part II of the degree of BA in Metallurgy and Science of Materials in the University of Oxford (Stone 1987). A summary of the methods used is given below; electron probe microanalysis of archaeological metalwork has been discussed in more detail elsewhere, especially in comparison with other methods of analysis (Northover and Rychner 1998).

This chapter focuses on copper alloys. The compositional analyses of the gold and silver alloy objects from Hoards A, B and C and stray finds S.16–18 and S.31 are shown in **Figures 18.1–3** and tabulated in Appendix 5, and a comparison of these alloys with those of Iron Age coins has also been published (Northover 1992). A short summary of the gold and silver alloys is given below, but in this volume the composition of precious metal objects is primarily discussed in Chapter 17.

Methods

Samples were either drilled or cut: complete pieces were generally drilled but where a fragment presented easy access for the saw a cut was made. For drilling, drill bits of 1mm diameter or less were used in a hand-held modelmaker's electric drill, while cut samples were taken with a jeweller's saw with 100 teeth/inch. The samples were hot-mounted in a copper-filled acrylic resin, ground and polished to a 1μm diamond finish.

Analysis was by electron probe microanalysis with wavelength dispersive spectrometry. Eleven elements were analysed over three 50μm squares on all samples, as listed in the tables. For the copper alloys arsenic was also quantified by three-point analyses on the bronze matrix remote from any possible lead inclusions, avoiding the well-known interference between the arsenic and lead X-ray spectra. As it transpired, almost all the bronze was unleaded. The data were combined to produce a composition in weight %, normalised to 100%. Where the metal was heavily corroded the uncorrected data are presented in italics with no concentration given for copper (**Table 18.1**).

After analysis the cut samples were examined with a metallographic microscope in both as-polished and etched states; the etch used was an acidified aqueous solution of ferric chloride, further diluted with ethanol.

Alloy definitions

In an assemblage which combines gold-, silver- and copper-based alloys with every evidence of recycling, alloy definitions can be rather fluid. To obtain a working definition of copper-based alloys, the compositions of all analysed objects from Hoards A, B and C were first sorted in

Cat. no.	Sample batch	Sample no.	Clarke hoard no.	Clarke inv. no.	Object type	Component tested	Sn	As	Sb	Pb	Co	Ni	Fe	Ag	Au	Zn	Bi	Cu
B.1d	SHMA	5	Hd. B No. 12	R1	Ring (small)		14.01	0.04	0.04	0.07	0.01	0.27	0.03	0.75	0.00	0.01	0.01	84.77
B.1d	SHMB	12	Hd. B No. 12	R1	Ring (small)		12.99	0.11	0.01	0.09	0.01	0.10	0.01	0.03	0.00	0.00	0.02	86.73
B.1d	SHMB	70	Hd. B No. 12	R6	Ring (small)		9.14	0.01	0.01	0.04	0.02	0.21	0.15	0.03	0.00	0.00	0.00	90.40
B.15, B.17	SHMB	P	Hd. B No. 24	LT20	Torc/bracelet (multi-strand, ?loop terminal)		14.88	0.09	0.05	0.07	0.02	0.27	0.02	0.01	0.01	0.01	0.02	84.55
B.16	SHMB	U	Hd. B No. 25	LT21	Wire/?torc/?bracelet		*17.61*	*0.00*	*0.04*	*0.30*	*0.04*	*0.07*	*0.07*	*0.24*	*0.05*	*0.06*	*0.00*	
B.28	SHMB	47	Hd. B No. 8	M1	Miscellaneous (staple/clamp)		14.13	0.32	0.31	1.03	0.08	0.13	0.11	0.06	0.00	0.01	0.03	83.79
C.22, C.26	SHMB	V	Hd. C No. 17	BT1	Torc/bracelet (multi-strand, buffer terminal)	Wire	12.60		0.01	0.04	0.01	0.10	0.01	0.01	0.00	0.01	0.01	87.23
C.23–4, C.28–30	SHMB	20	Hd. C No. 19	LT22	Torc/bracelet (multi-strand)		12.98	0.23	0.19	0.31	0.01	0.18	0.01	0.14	0.00	0.02	0.00	85.93
C.23–4, C.28–30	SHMA	8	Hd. C No. 19	LT22	Torc/bracelet (multi-strand)		11.18	0.21	0.04	0.07	0.18	0.07	0.17	0.01	0.01	0.00	0.02	88.05
C.25	SHMB	7	Hd. C No. 18	BT2	Torc/bracelet (multi-strand, buffer terminal)	Wire	9.26	0.10	0.94	0.18	0.01	0.11	0.01	0.09	0.00	0.00	0.03	89.27
C.27, C.31	SHMB	16	Hd. C No. 20	BT3	Torc/bracelet (multi-strand, buffer terminal)	Wire	13.19	0.11	0.68	0.05	0.00	0.35	0.08	0.03	0.03	0.00	0.01	85.47
C.27, C.31	SHMB	79	Hd. C No. 20	BT3	Torc/bracelet (multi-strand, buffer terminal)	Terminal	12.99	0.15	0.18	0.28	0.01	0.17	0.01	0.04	0.01	0.03	0.02	86.11
C.49	SHMB	68	Hd. C No. 5	R3	Ring (small)		10.32	0.22	0.13	0.71	0.02	0.08	0.03	0.28	0.02	0.01	0.00	88.18
C.49	SHMB	69	Hd. C No. 5	R3	Ring (small)		9.22	0.19	0.20	0.53	0.05	0.07	0.08	0.04	0.00	0.00	0.04	89.58
C.54	SHMA	9	Hd. C No. 7	SB2	Sheet (binding strip/fitting)		10.94	0.29	0.11	0.14	0.09	0.05	0.07	0.04	0.00	0.01	0.02	88.25
B/C.9	SHMB	84	Hd. B/C No. 39	LT33	Torc (multi-strand, loop terminal)		10.89	0.31	0.09	0.26	0.16	0.06	0.09	0.50	0.01	0.00	0.01	87.62
B/C.10	SHMB	81	Hd. B/C No. 37	LT31	Torc (multi-strand, loop terminal)		10.43	0.38	0.24	0.46	0.05	0.10	0.11	0.11	0.03	0.00	0.06	88.03
B/C.11	SHMB	82	Hd. B/C No. 38	LT32	Torc (multi-strand, loop terminal)		11.33	0.28	0.21	0.25	0.05	0.11	0.14	0.00	0.04	0.01	0.02	87.56
B/C.12	SHMB	83	Hd. B/C No. 36	LT30	Bracelet (multi-strand, loop terminal)		10.39	0.46	0.08	0.39	0.06	0.09	0.03	0.13	0.01	0.00	0.00	88.36
B/C.13	SHMB	30	Hd. B/C No. 47	LT41	Torc/bracelet (multi-strand, loop terminal)		10.94	0.24	0.10	0.41	0.06	0.07	1.55	0.04	0.00	0.00	0.03	86.97
B/C.14	SHMA	22	Hd. B/C No. 51	LT45	Torc/bracelet (multi-strand, loop terminal)		11.46	0.45	0.29	0.09	0.04	0.11	0.04	0.08	0.08	0.01	0.03	87.33
B/C.15	SHMB	W	Hd. B/C No. 54	LT48	Torc/bracelet (multi-strand, loop terminal)		13.53		0.12	0.62	0.04	0.05	0.06	0.03	0.00	0.00	0.01	85.55

Table 18.1 Analysis of copper alloy objects from Snettisham Hoards B and C

In the table the sample numbers have two components: 'Batch' (SHMA and SHMB), which groups the samples taken in a given museum visit, and 'No.' is the number within a batch. The Clarke (1954) hoard numbers and inventory numbers are both given, as well as the catalogue numbers from this volume. Due to the complexities of cross-referencing with Clarke's system (see Concordance, Appendix 3a), it has not always been possible to create a one-to-one concordance with the catalogue numbers used in this volume, and thus sometimes a range is given. Two objects were highly corroded; their compositions are given in italics with copper omitted; a blank in the column for arsenic means that the analysis was not made.

Cat. no.	Sample batch	Sample no.	Clarke hoard no.	Clarke inv. no.	Object type	Component tested	Sn	As	Sb	Pb	Co	Ni	Fe	Ag	Au	Zn	Bi	Cu
B/C.16	SHMB	51	Hd. B/C No. 44	LT38	Torc/bracelet (multi-strand, loop terminal)		12.87	0.04	0.05	0.09	0.00	0.27	0.02	0.07	0.00	0.03	0.00	86.56
B/C.17–8, B/C.21–2, B/C.26–34, B/C.38–40	SHMB	28	Hd. B/C No. 46	LT40	Torc/bracelet (multi-strand, loop terminal)		7.86	0.12	1.44	0.11	0.01	0.43	0.18	0.05	0.02	0.00	0.00	89.78
B/C.17–8, B/C.21–2, B/C.26–34, B/C.38–40	SHMB	49	Hd. B/C No. 46	LT40	Torc/bracelet (multi-strand, loop terminal)		12.19	0.28	0.11	0.91	0.12	0.07	0.24	0.17	0.05	0.00	0.02	85.84
B/C.17–8, B/C.21–2, B/C.26–34, B/C.38–40	SHMB	58	Hd. B/C No. 46	LT40	Torc/bracelet (multi-strand, loop terminal)		12.80	0.08	0.07	0.20	0..01	0.25	0.07	0.18	0.04	0.00	0.00	86.32
B/C.17–8, B/C.21–2, B/C.26–34, B/C.38–40	SHMB	54	Hd. B/C No. 46	LT40	Torc/bracelet (multi-strand, loop terminal)		11.58	0.30	0.06	1.54	0.07	0.06	0.01	0.50	0.00	0.03	0.00	85.85
B/C.17–8, B/C.21–2, B/C.26–34, B/C.38–40	SHMB	55	Hd. B/C No. 46	LT40	Torc/bracelet (multi-strand, loop terminal)		12.83	0.19	0.04	0.30	0.02	0.06	0.03	0.33	0.00	0.01	0.00	86.19
B/C.17–8, B/C.21–2, B/C.26–34, B/C.38–40	SHMB	53	Hd. B/C No. 46	LT40	Torc/bracelet (multi-strand, loop terminal)		11.79	0.15	0.03	0.22	0.04	0.06	0.09	0.65	0.18	0.04	0.05	86.70
B/C.17–8, B/C.21–2, B/C.26–34, B/C.38–40	SHMA	1	Hd. B/C No. 46	LT40	Torc/bracelet (multi-strand, loop terminal)		11.52	0.11	0.59	0.03	0.01	0.30	0.07	0.02	0.00	0.00	0.04	87.31
B/C.17–8, B/C.21–2, B/C.26–34, B/C.38–40	SHMA	2	Hd. B/C No. 46	LT40	Torc/bracelet (multi-strand, loop terminal)		11.67	0.11	0.61	0.03	0.01	0.29	0.06	0.04	0.01	0.00	0.03	87.15
B/C.19	SHMB	27	Hd. B/C No. 41	LT35	Torc/bracelet (multi-strand, loop terminal)		11.72	0.23	0.05	0.31	0.02	0.05	0.01	0.26	0.02	0.01	0.00	87.32
B/C.20	SHMB	50	Hd. B/C No. 45	LT39	Torc/bracelet (multi-strand, loop terminal)		13.10	0.03	0.05	0.06	0.00	0.25	0.04	0.02	0.19	0.00	0.00	86.26
B/C.24	SHMB	35	Hd. B/C No. 49	LT43	Torc/bracelet (multi-strand, loop terminal)		11.38	0.43	0.10	0.67	0.06	0.07	0.07	0.10	0.00	0.00	0.01	87.11
B/C.24	SHMB	37	Hd. B/C No. 49	LT43	Torc/bracelet (multi-strand, loop terminal)		12.63	0.58	0.12	0.48	0.07	0.08	0.08	0.08	0.00	0.02	0.02	86.39
B/C.24	SHMB	34	Hd. B/C No. 49	LT43	Torc/bracelet (multi-strand, loop terminal)		12.33	0.27	0.09	0.42	0.01	0.05	0.06	0.03	0.02	0.00	0.00	86.72
B/C.25	SHMB	X	Hd. B/C No. 43	LT37	Torc/bracelet (multi-strand, loop terminal)		13.11		0.11	0.32	0.11	0.05	0.17	0.15	0.04	0.00	0.08	85.86

Table 18.1 continued

Cat. no.	Sample batch	Sample no.	Clarke hoard no.	Clarke inv. no.	Object type	Component tested	Sn	As	Sb	Pb	Co	Ni	Fe	Ag	Au	Zn	Bi	Cu
B/C.35	SHMB	38	Hd. B/C No. 48	LT42	Torc/bracelet (multi-strand, loop terminal)		11.55	0.45	0.29	0.09	0.04	0.11	0.07	0.02	0.02	0.00	0.00	87.36
B/C.36	SHMB	29	Hd. B/C No. 52	LT46	Torc/bracelet (multi-strand, loop terminal)		9.20	0.39	0.24	0.19	0.04	0.11	0.07	0.02	0.00	0.00	0.00	89.74
B/C.37	SHMB	52	Hd. B/C No. 40	LT34	Torc/bracelet (multi-strand, loop terminal)		10.36	0.24	0.02	0.47	0.08	0.09	0.06	0.13	0.03	0.00	0.00	88.52
B/C.41	SHMB	Y	Hd. B/C No. 35	LT29	Wire/?torc/?bracelet		12.29		0.55	0.08	0.01	0.30	0.00	0.09	0.04	0.02	0.01	86.62
B/C.41	SHMB	Z	Hd. B/C No. 35	LT29	Wire/?torc/?bracelet		12.37		0.55	0.07	0.01	0.33	0.01	0.07	0.00	0.00	0.02	86.58
B/C.42–5	SHMB	32	Hd. B/C No. 32	LT26	Torc/bracelet (multi-strand)		12.31	0.22	0.13	0.58	0.07	0.09	0.32	0.05	0.00	0.00	0.00	86.23
B/C.42–5	SHMB	19	Hd. B/C No. 32	LT26	Torc/bracelet (multi-strand)		12.04	0.31	0.13	0.47	0.10	0.07	0.19	0.03	0.00	0.00	0.00	86.66
B/C.47–8	SHMB	11	Hd. B/C No. 29	LT23	Small Torc (multi-strand)		10.26	0.04	0.19	0.11	0.01	0.35	0.01	0.01	0.00	0.00	0.02	89.00
B/C.47–8	SHMB	3	Hd. B/C No. 29	LT23	Small Torc (multi-strand)		10.57	0.31	0.18	0.21	0.01	0.35	0.01	0.02	0.00	0.00	0.01	88.34
B/C.49, B/C.51–3, B/C.56, B/C.60–2	SHMA	10	Hd. B/C No. 31	LT25	Torc/bracelet (multi-strand, ?loop terminal)		11.99	0.07	0.66	0.00	0.00	0.35	0.09	0.02	0.01	0.01	0.02	86.79
B/C.49, B/C.51–3, B/C.56, B/C.60–2	SHMA	15	Hd. B/C No. 31	LT25	Torc/bracelet (multi-strand, ?loop terminal)		11.32	0.40	0.14	0.31	0.09	0.09	0.21	0.02	0.00	0.00	0.00	87.42
B/C.50	SHMB	15	Hd. B/C No. 30	LT24	Torc/bracelet (multi-strand, loop terminal)		12.03	0.06	0.61	0.03	0.01	0.29	0.03	0.03	0.01	0.01	0.01	86.88
B/C.54–5	SHMB	13	Hd. B/C No. 33	LT27	Torc/bracelet (multi-strand, loop terminal)		11.17	0.04	0.30	0.82	0.01	0.10	0.12	0.06	0.00	0.01	0.01	87.37
B/C. 57–9	SHMB	1	Hd. B/C No. 34	LT28	Torc/bracelet (multi-strand)		12.02	0.11	0.02	0.16	0.19	0.06	0.18	0.03	0.04	0.02	0.03	87.14
B/C.65	SHMB	73	Hd. B/C No. 1	RL2	Ring (large)		8.95	0.16	0.18	0.19	0.02	0.15	0.04	0.06	0.04	0.00	0.01	90.20
B/C.66	SHMA	26	Hd. B/C No. 3	RL4	Ring (large)		9.81	0.28	0.08	1.00	0.07	0.07	0.14	0.14	0.01	0.03	0.03	88.35
B/C.66	SHMB	71	Hd. B/C No. 3	RL4	Ring (large)		10.16	0.23	0.08	0.32	0.07	0.06	0.07	0.17	0.00	0.00	0.04	88.80
B/C.67	SHMB	74	Hd. B/C No. 2	RL3	Ring (large)		9.57	0.16	0.20	0.16	0.00	0.14	0.05	0.08	0.01	0.01	0.02	89.60
B/C.68	SHMB	75	Hd. B/C No. 4	RL5	Ring (large)		9.63	0.26	0.10	0.40	0.09	0.05	0.03	0.89	0.03	0.00	0.00	88.52
B/C.69	SHMB	72	Hd. B/C No. 5	RL6	Ring (large)		12.67	0.16	0.21	0.16	0.03	0.16	0.04	0.12	0.00	0.00	0.01	86.44
B/C.70	SHMB	67	Hd. B/C No. 8	RL9	Ring (large)		13.19	0.03	0.05	0.02	0.01	0.26	0.06	0.54	0.02	0.01	0.02	85.80

Table 18.1 continued

Cat. no.	Sample batch	Sample no.	Clarke hoard no.	Clarke inv. no.	Object type	Component tested	Sn	As	Sb	Pb	Co	Ni	Fe	Ag	Au	Zn	Bi	Cu
B/C.71	SHMB	59	Hd. B/C No. 6	RL7	Ring (large)		10.69	0.19	0.21	0.20	0.01	0.16	0.05	0.10	0.00	0.00	0.00	88.39
B/C.72	SHMB	D	Hd. B/C No. 7	RL8	Ring (large)		16.11	0.26	0.08	0.50	0.05	0.06	0.71	0.11	0.09	0.00	0.01	82.02
B/C.72	SHMA	4	Hd. B/C No. 7	RL8	Ring (large)		14.43	0.04	0.07	0.05	0.01	0.30	0.03	0.56	0.01	0.00	0.02	84.48
B/C.73–6	SHMB	64	Hd. B/C No. 9	RL10	Ring (large)		12.37	0.18	0.15	0.30	0.06	0.11	0.05	0.05	0.00	0.00	0.01	86.72
B/C.73–6	SHMA	25	Hd. B/C No. 9	RL10	Ring (large)		13.11	0.04	0.04	0.03	0.01	0.27	0.07	0.67	0.00	0.00	0.01	85.76
B/C.73–6	SHMB	31	Hd. B/C No. 9	RL10	Ring (large)		13.87	0.04	0.03	0.01	0.01	0.25	0.03	0.48	0.00	0.00	0.00	85.28
B/C.77	SHMB	78	Hd. B/C No. 11	R5	Ring (small)		9.83	0.20	0.06	2.59	0.06	0.04	0.01	0.45	0.05	0.01	0.00	86.70
B/C.79	SHMB	76	Hd. B/C No. 14	R8	Ring (small)		11.64	0.23	0.02	0.25	0.03	0.05	0.05	0.38	0.03	0.01	0.00	87.31
B/C.80	SHMB	65	Hd. B/C No. 16	R10	Ring (small)		8.89	0.15	0.11	0.45	0.03	0.07	0.01	0.04	0.03	0.00	0.00	90.22
B/C.81	SHMB	R	Hd. B/C No. 17	R13	Ring (small)		22.32		*0.11*	*1.42*	*0.05*	*0.06*	*0.22*	*0.01*	*0.00*	*0.00*	*0.03.*	
B/C.82	SHMB	80	Hd. B/C No. 13	R7	Ring (small)		11.88	0.36	0.14	1.02	0.11	0.06	0.07	0.04	0.00	0.00	0.01	86.31
B/C.83	SHMB	96	Hd. B/C No. 15	R9	Ring (small)		11.36	0.25	0.21	0.26	0.05	0.11	0.02	0.00	0.04	0.00	0.02	87.68
B/C.88	SHMB	44	Hd. B/C No. 22	SB4	Sheet (scale pan)		11.03	0.45	0.06	0.38	0.07	0.07	0.10	0.05	0.02	0.02	0.01	87.74
B/C.89	SHMA	6	Hd. B/C No. 23	SB1	Sheet (shield binding)		4.97	0.17	0.40	0.15	0.08	0.14	0.01	0.17	0.00	0.03	0.00	93.88
B/C.89	SHMA	14	Hd. B/C No. 23	SB1	Sheet (shield binding)		4.75	0.17	0.39	0.07	0.10	0.14	0.01	0.14	0.01	0.02	0.03	94.18
B/C.90	SHMB	41	Hd. B/C No. 25	M2	Sheet (fitting)		11.03	0.36	0.18	0.49	0.03	0.05	0.02	0.20	0.05	0.00	0.02	87.58
B/C.91–5	SHMA	12	Hd. B/C No. 24	SB7	Sheet		10.65	0.22	0.20	0.27	0.26	0.14	0.10	0.03	0.01	0.00	0.00	88.13
B/C.91–5	SHMA	13	Hd. B/C No. 24	SB7	Sheet		15.73	0.51	0.05	0.14	0.13	0.07	0.19	0.04	0.02	0.02	0.00	83.10
B/C.91–5	SHMB	39	Hd. B/C No. 24	SB7	Sheet		13.02	0.41	0.04	0.29	0.13	0.05	0.16	0.00	0.00	0.02	0.00	85.88
B/C.91–5	SHMB	45	Hd. B/C No. 24	SB7	Sheet		12.87	0.46	0.04	0.42	0.13	0.05	0.16	0.03	0.02	0.00	0.00	85.82
B/C.91–5	SHMB	33	Hd. B/C No. 24	SB7	Sheet		11.94	0.41	0.03	0.28	0.13	0.05	0.64	0.03	0.03	0.04	0.01	86.41
B/C.91–5	SHMA	3	Hd. B/C No. 24	SB7	Sheet		13.26	0.22	0.03	0.09	0.11	0.03	0.20	0.01	0.03	0.06	0.02	85.95
B/C.91–5	SHMB	40	Hd. B/C No. 24	M7	Sheet		12.81	0.40	0.09	0.42	0.13	0.06	0.15	0.01	0.00	0.00	0.00	85.93

Table 18.1 continued

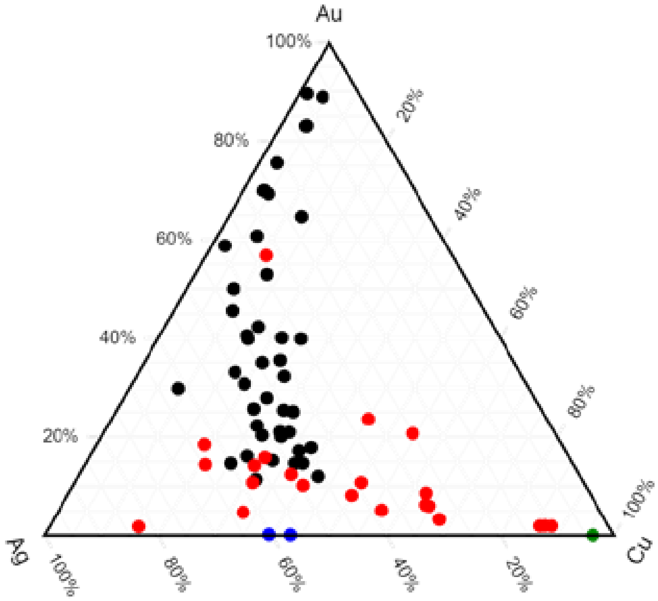


Figure 18.1 Alloy compositions of objects from Snettisham Hoards A, B and C containing more than impurity levels of gold or silver (see Appendix 5). Black indicates objects with over 1.78% gold and no tin, or only trace levels. These are ternary alloys of gold, silver and copper. Objects with over 1.78% gold and higher than trace levels of tin are shown in red. These are a mixture of a gold-silver-copper alloy and bronze. The two objects shown in blue are silver-copper alloys. The sample shown in green contained very little gold but 6.57% tin, suggesting bronze alloyed with a small percentage of a gold-silver-copper alloy (© Peter Northover)

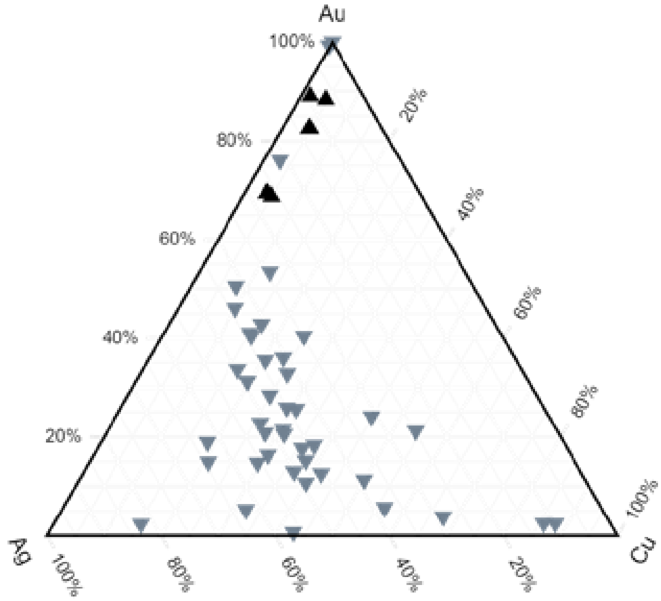


Figure 18.2 Alloy compositions of torcs from Snettisham Hoards A, B and C containing more than impurity levels of gold or silver (see Figure 18.1 and Appendix 5). Black triangles are samples from tubular torcs. Grey inverted triangles are samples from multi-strand torcs (© Peter Northover)

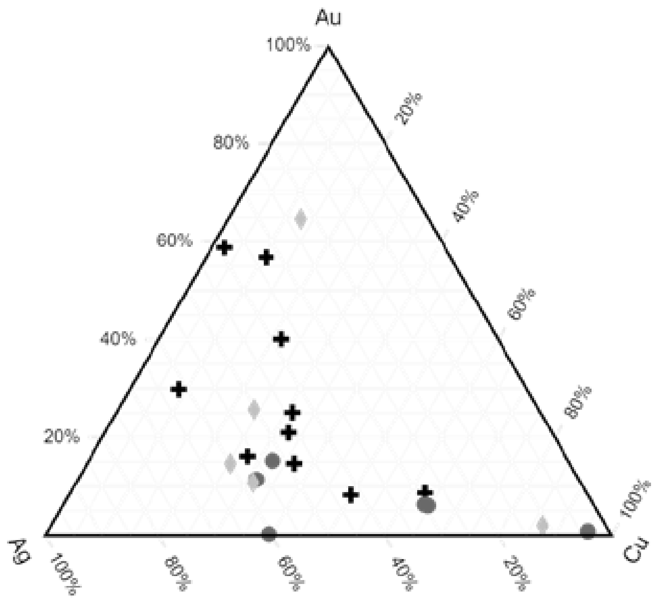


Figure 18.3 Alloy compositions of rings and ingots from Snettisham Hoards A, B and C containing more than impurity levels of gold or silver (see Fig. 18.1 and Appendix 5). Black crosses are samples from ingots. Grey circles are samples from large rings, and light-grey diamonds are samples from small rings (© Peter Northover)

descending order of gold content. An abrupt break at 1.78% gold was observed. Objects with below 1.78% gold were then sorted by silver content, which revealed two silver-copper alloys (large ring B.20 and torc S.18, shown in blue in **Fig. 18.1**, see Appendix 5) and one object (large ring C.46, shown in green in **Fig. 18.1**, see Appendix 5) made from bronze alloyed with a small percentage of a gold-silver-copper alloy, the mixed alloy containing 3.67% silver. The alloys containing levels of gold and silver above these limits are tabulated in Appendix 5, and summarised in **Figures 18.1–3**.

The remaining 82 compositions contained very little gold or silver, and can all realistically be described as copper-based alloys. They are listed in **Table 18.1**. A short summary of the precious metal alloys follows, whilst the remainder of this chapter focuses on the copper alloy objects. Two are so corroded that a valid analysis could not be made, and they are excluded from the following discussion: for these two the element concentrations are given in italics in **Table 18.1**.

Gold/silver alloy objects

The compositions of the gold and silver alloy objects are summarised in **Figures 18.1–3** with the data presented in Appendix 5. This includes the analysed objects from Hoards B and C, as well as a small number of torc stray finds from the 1960s–70s: S.16, S.17, S.18 and S.31. Most of the objects with at least 1.78% gold were ternary alloys of gold, silver, and copper, clustered in the whitish to yellow colour zones of the ternary diagram (Northover 1992, see black dots in **Fig. 18.1**, and Appendix 5). Other objects with over 1.78% gold, including all of those with the lowest gold levels, contain levels of tin sufficient to suggest that they are clearly a mixture of a gold-silver-copper alloy and bronze. From the 1987 analyses there are 26 samples from gold-silver-copper alloys where tin is detected at more than a low trace level contents (shown in red in **Fig. 18.1**, see Appendix 5); all but two have >10% silver, and tin contents vary from 0.2% to 6.9%. At one extreme, three examples (samples from B.7–8, B.9 and C.46) have 80% or more copper and could realistically be described as bronzes. These would probably have had the appearance, when wrought and polished, of medium to high-tin bronzes. At the other extreme is an alloy

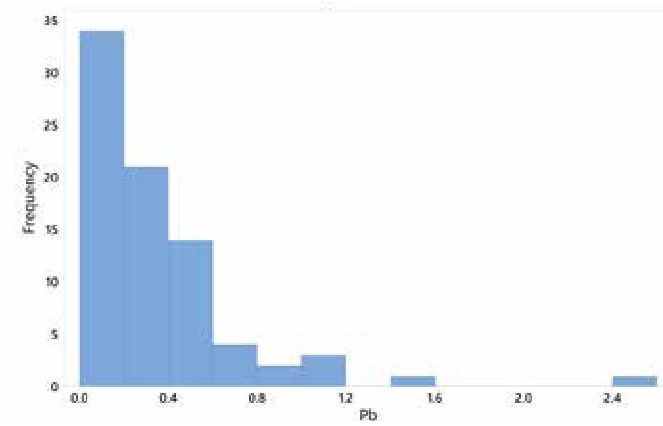


Figure 18.4 Histogram of lead (Pb) content for the copper alloy objects in Hoards A, B and C (see Table 18.1) (© Peter Northover)

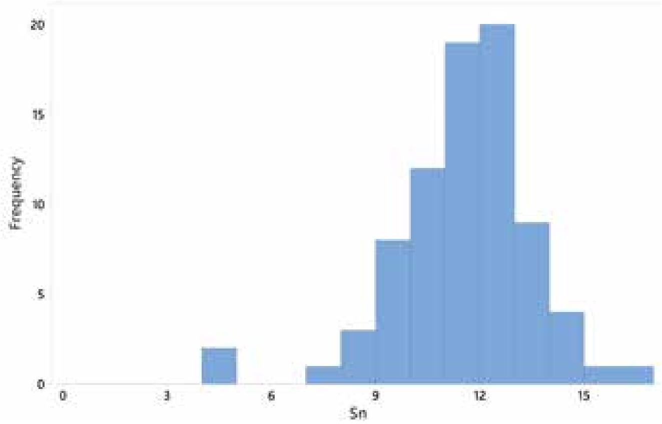


Figure 18.5 Histogram of tin (Sn) content in Hoards A, B and C (see Table 18.1) (© Peter Northover)

with 56.3% gold in which the proportions of copper (10.51%) and tin (0.73%) suggest that bronze rather than copper was used in making up the alloy (sample from B.26). The remaining alloys are very varied but the maximum gold content is 23.1% so that there would be limits to how much the surface could be manipulated to achieve a gold colour, while others would certainly have a silvery finish. Without experiment it is difficult to predict the original appearance of many of these objects.

Figures 18.2 and **18.3** show the same composition data as **Figure 18.1**, broken down by object type. **Figure 18.2** shows a small group of high-gold (over 65%), low-copper torcs, clustered in the top left of the ternary diagram. This group includes all the tubular torc samples and three multi-strand torcs. Most of the multi-strand torc samples were lower in gold, below 55%, including both ternary gold-silver-copper alloys and the lower-gold group of gold-silver-copper alloys mixed with bronze (shown in red in **Fig. 18.1**). Ingots and rings also showed a similarly broad range of alloy compositions (**Fig. 18.3**), with no clear grouping by object type, suggesting that similar alloys were used in precious metal ingots, rings, and multi-strand torcs, with only tubular torcs consistently showing a distinctive, high-gold composition.

Copper alloys

Within the ambit of copper-based alloys in the Late Iron Age there are four possibilities: copper, bronze, leaded bronze, and copper-zinc alloys. Inspection of **Table 18.1** shows that there is no unalloyed copper at Snettisham, and zinc is barely detected. In fact, the earliest copper-zinc alloy so far identified in England is in the Trinovantian coinage in approximately the last decade of the 1st century BC (Northover 1992). To identify possible instances of the use of leaded bronze, a histogram of lead contents was constructed (**Fig. 18.4**). There are only two lead contents above 1%, at 1.5% and 2.6%: these are both wrought products (small ring B/C.77 and a torc fragment from the group with Clarke ref. B/C46, which includes the following catalogue numbers in this volume: B/C.17–B/C.18, B/C.21–B/C.22, B/C.26–B/C.34, B/C.38–B/C.40) so the lead offers very little useful contribution to the properties of the bronze. It is most probable that some leaded bronze was included in a melt; such bronze could have been acquired either through trade, however indirect, with the Roman world, or through the accidental recovery of Late Bronze Age metalwork, something very possible in Norfolk. This is consistent with the results from Iron Age bronze so far analysed in England as a whole although these are mainly concentrated in a small number of major excavations such as Danebury (Northover 1984; 1987; 1991a; 1991b; 2004a; Barnes 2023).

For understanding the variety of tin contents a histogram was constructed (**Fig. 18.5**). This shows a near normal distribution of medium-tin bronzes with an observed mean of 11.5 ± 1.9% tin. There will be some bias to higher tin contents because of the effects of corrosion penetrating the samples; the true mean and standard deviation will be slightly smaller. There is also an outlier of two low-tin bronze compositions which in fact come from the same set of bindings from a hide-shaped shield (B/C.89); this is just an anomaly as other samples of sheet, for example from B/C.88 or B/C.91–5, fall in the centre of the main distribution.

The use of a bronze with 11–12% tin would serve the makers of bronze torcs very well because of its combination of strength, hardenability, wear resistance, and colour. Comparison with other sites such as Maiden Castle (Northover 1991a) and Danebury (1991b) shows the importance of this type of bronze by the 1st century BC, although in earlier phases of the Iron Age tin contents might be rather lower. Further, there appears to be no significant difference between wrought and cast products for the period during which it is proposed that most of the copper alloy objects from Snettisham were produced, in the final centuries BC.

Impurity patterns

As the metallurgical study of Iron Age bronze developed during the 1980s and 1990s (e.g. Northover 1991a; 1991b) an attempt was made to classify impurity patterns in the same way as had been done for the Bronze Age (Northover 1980). The Bronze Age classification itself could not be used because patterns were found which did not exist in the Bronze Age. The results were not completely satisfactory save for the definition of what is known as ‘Group 1’, which was characterised by Co>Ni and Sb<0.10%. It was felt that the use of the patterns in the present context would be too confusing, especially where there was a strong probability that much of the metal was recycled, and for clarity a

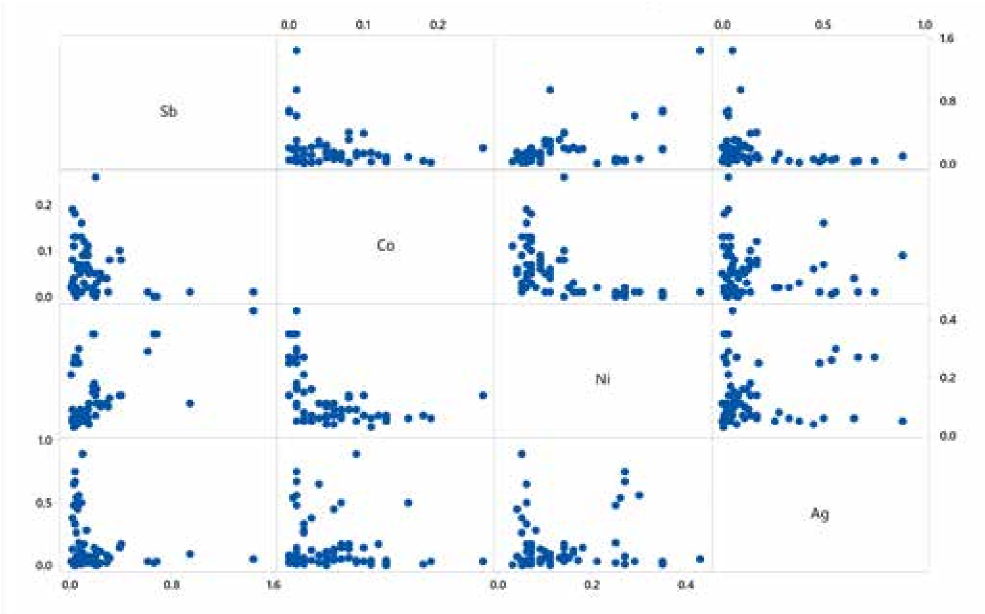


Figure 18.6 Matrix plot of antimony (Sb), cobalt (Co), nickel (Ni) and silver (Ag) in Hoards A, B and C (see Table 18.1) (© Peter Northover)

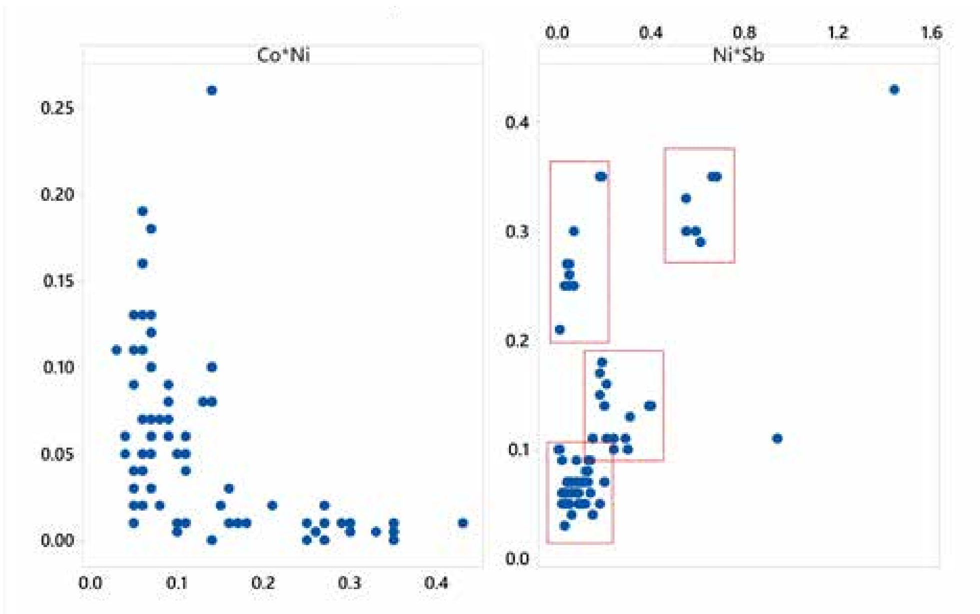


Figure 18.7 Scatterplots of cobalt vs. nickel, and nickel vs. antimony in Hoards A, B and C (see Table 18.1) (© Peter Northover)

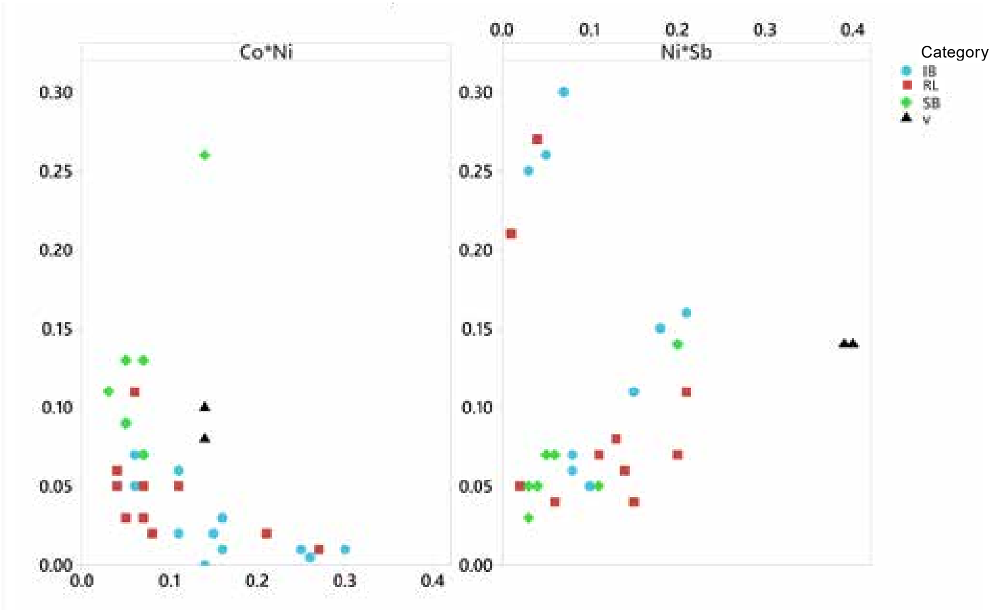


Figure 18.8 Scatterplots of cobalt vs. nickel, and nickel vs. antimony for copper alloy rings and sheet objects in Hoards A, B and C (see Table 18.2 for object type abbreviations) (© Peter Northover)

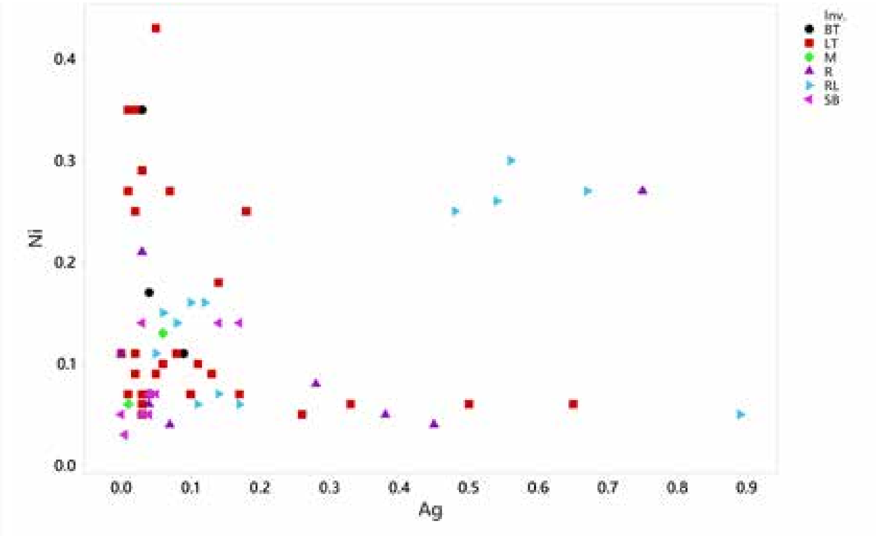


Figure 18.9 Scatterplot of nickel vs. silver for copper alloy objects in Hoards A, B and C (see Table 18.2 for object type abbreviations) (© Peter Northover)

graphical approach to identifying significant groupings amongst the Snettisham material was adopted.

As a first step a matrix plot was constructed for the four most diagnostic impurities: antimony, cobalt, nickel, and silver (**Fig. 18.6**). The plot is designed to give an overview of impurity patterns by presenting scatterplots of all possible element pairs of the selected impurities. Very visibly there is considerable diversity among the impurity patterns, and there are groupings where one element or another is important in some way, for example the Group 1 metal already mentioned with Co>Ni, and the higher cobalt contents are associated with low antimony. Another grouping has nickel strongly correlated with antimony, a feature which, on the basis of comparison with Late Bronze Age material, is of Alpine or Central European origin. Also worthy of note is a small cluster with relatively high silver and nickel.

The next step was to examine one or two element pairs at a larger scale and begin to make a better definition of possible groupings. The plots of cobalt against nickel and nickel against antimony in **Figure 18.7** demonstrate the influence of Group 1 metal with Co>Ni, and also a degree of separation into clusters based on nickel and antimony. There is a caveat to be made here in that some of the groups may contain multiple samples from the same object; inevitable given the fragmentary nature of many objects, the loop terminal and buffer terminal torcs in particular. Even so, it is clear that the bronze represented in the Snettisham hoards has a variety of ultimate origins but, with such small parcels of bronze, the results will be descriptive of the connections of individual craftspeople rather than

Table 18.2 The object type codes used in Figures 18.8–11

Object type	Category code
Multi-strand torc (loop terminal)	LT
Multi-strand torc (buffer terminal)	BT
Ring (small)	R
Ring (large)	RL
Sheet or binding fragment	SB
V-shaped binding from hide-shaped shield	V
Miscellaneous	M

providing a picture of the circulation of metal on a regional or even larger scale.

A first step in exploring these connections is to determine whether any of the impurity patterns correlate with specific object types. For the sake of clarity in this endeavour the torcs and other types are treated separately. **Figure 18.8** picks out from the data in **Figure 18.7** for just the rings and sheet bronze, with the V-shaped shield bindings identified separately. There is, plainly, a correlation between object type and impurity pattern. One cluster comprises sheet bronze pieces with Co>Ni and Sb<0.10%, i.e. Group 1. At both Maiden Castle and Danebury this bronze is very much associated with the working, reworking, or recycling of sheet and the copper was associated with an origin in the south-west of England. In the Snettisham collection this metal could have come to the area as scrap or have come from an object, be it a shield or a scabbard, dismantled locally. There are three outliers among the sheet samples: the two samples from the V-shaped shield binding and one other piece of sheet. These have what can be best described as an As/Sb/Co/Ni/Ag impurity pattern (Group 2), the antimony contents suggesting a continental origin for the copper. The best parallels so far, especially for the example with the high cobalt content of 0.26% (a sample from B/C.91–5), lie in Switzerland in the Late Bronze Age (Northover 2004b).

The rings are wrought products that can be regarded as either finished, for use as we see them, or semi-finished, a stage in the manufacture of another product. Overall, it is perhaps possible to see some differentiation in composition between the smaller and larger rings, but this may just be the effect of analysing a small sample from what was once a larger population. Overall, the rings fall into two clusters, one trending to higher nickel contents and low antimony, and the other with nickel and antimony correlated. While the latter group certainly reflects the incorporation of some continental metal, not surprising in Norfolk, the former certainly poses a puzzle in that in a small number of objects, the nickel is associated with a high silver content, as seen in **Figure 18.9**. This Ni/Ag pattern has only been observed at Snettisham and, in that context, it is quite possible that some silver metal or alloy has been incorporated in the alloy. This is certainly true of three objects with a sufficiently high silver content that they are included in Appendix 5, rather than in

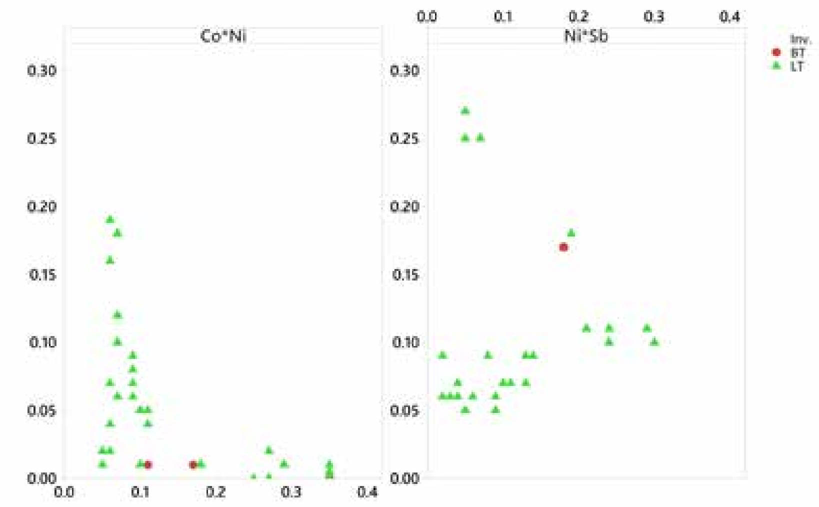


Figure 18.10 Scatterplots of cobalt vs. nickel, and nickel vs. antimony for loop terminal (LT) and buffer terminal (BT) torcs (© Peter Northover)

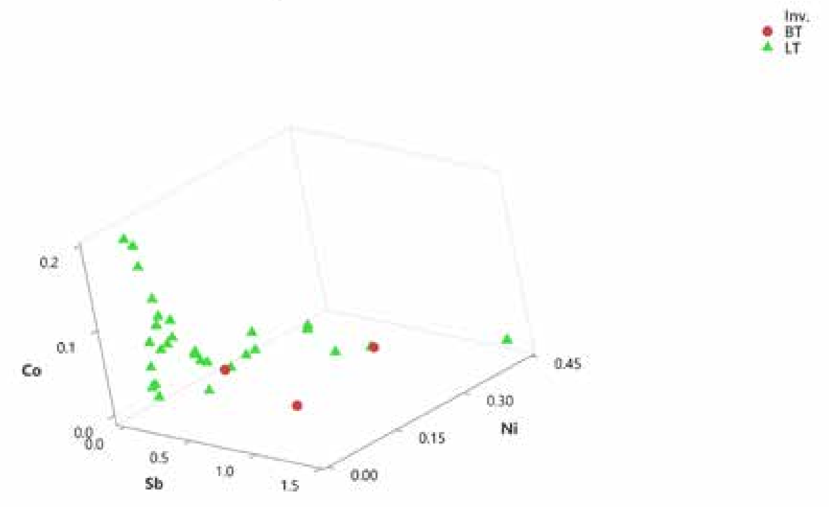


Figure 18.11 3D scatterplot of cobalt vs. nickel vs. antimony for loop terminal (LT) and buffer terminal (BT) torcs (© Peter Northover)

Table 18.1 among the copper alloys. These are large ring C.46 which contains 6.6% tin, 3.7% silver, and 0.8% gold, but has a more normal 0.11% nickel, and the two straight silver-copper alloys (large ring B.20 and torc S.18). Another series of increasing silver contents is associated with very low nickel contents mainly in loop terminal torcs, but there are no objects with nickel contents intermediate between these two groups. A general conclusion is that only certain bronze types were processed where silver was present, but it can also be argued that the Ni/Ag pattern is an addition to the diversity of copper sources represented at Snettisham.

The graphical treatment of the impurities in the rings and sheet is repeated for the bronze wire torcs in **Figure 18.10**. Because the axes have been truncated to match those in **Figure 18.8**, a 3D scatterplot of cobalt, nickel, and antimony is presented in **Figure 18.11** to show the full dataset, the excluded values being increased percentages of nickel, up to 0.43%, and antimony, up to 1.44%. These two elements are quite strongly correlated, a trait of bronze imported into East Anglia from the continent at various times in the later Bronze Age (Northover 1982; 1983), but not one associated with British ores. Overlaps between the distributions in **Figures 18.8** and **18.10** are only partial; for example, some high Co, low Ni and low Co Ni appearing in both, and the simplest explanation is that the metal in the bracelets and rings is the result of recycling and mixing the metal in the torcs, the broken fragments of wire making an ideal crucible charge.

The impurity patterns also offer some chronological clues when they are compared with the sequences from excavations such as Danebury and Maiden Castle. One of the main conclusions from these was that Group 1 metal was disappearing from circulation during the second half of the 1st century BC, if not a little earlier; it is absent from demonstrably later sites in eastern England such as ACS Stansted (Northover 2004a) and the Lexden tumulus (Northover unpublished). Therefore, any such metal at Snettisham is not going to be any later than mid-1st century BC. This chronological marker is also consistent with the absence of alloys with zinc and the almost complete absence of leaded bronze from the Snettisham assemblages.

Metallography

Many of the bronze samples were cut rather than drilled and so were available for metallography. The results were simple and rather uniform, with the wrought bronze typically having a recrystallised grain size of around 30μm, and almost all showed substantial cold work. In the case of the bracelets and rings this could be the stage at which they were left before further work while with the wire torcs the wire would have been annealed, cleaned, and polished, and then

twisted, no further heat treatment then taking place. See Chapter 17 for more on manufacturing techniques.

Conclusion

This analysis has shown that the bronze at Snettisham, or at least the copper in it, had diverse origins, that with Co>Ni undoubtedly British, and that with nickel and antimony as characteristic impurities having a continental origin. Local recycling which produced products such as the rings could mix these two together. The form in which metal arrived in the workshops could be sheet or wire scrap, or finished objects which were then dismantled, or possibly just re-used. Bronze also contributed to some of the precious metal alloys, notably those that were silver-rich: as copper metal is not represented in the hoards, one can envisage ternary alloys such as those in the contemporary British and Gallic gold coinages being further debased with bronze and with silver-copper alloys. Impurity patterns support a date of manufacture for many of the bronze objects tested as no later than the first half of the 1st century BC.

Chapter 19
Seeing the Wood for the Trees: Evaluating the Woody Resources of Snettisham

Caroline Cartwright

Introduction

Scanning electron microscopy examination of four small coiled multi-strand wire copper alloy torcs from Snettisham in the BM and four examples from NCM (see **Table 19.1**) revealed that each had an organic core, around which the torc wires had been wound. Although these cores are now preserved in the form of charred wood, originally they were slender coppiced fresh wood wands from alder, hazel, dogwood, field maple, willow, hawthorn and elder trees, which were sufficiently flexible to provide the appropriate support for these torcs during the wire-coiling process.

In 2011, Cartwright undertook a series of charring experiments of coppiced alder wood, documenting the resultant anatomical changes as a case study for comparison with the alder cores of torcs F.166 and C.22, C.26. The principle behind such charring experiments rests in the fact that wood retains most of its anatomical characteristics when charred, but the charring temperature determines the appearance of the qualitative cellular features necessary for identification, with each species reacting differently (Gasson *et al.* 2017). These laboratory experiments on modern alder wood, coupled with anatomical comparisons with the alder cores of the torcs, suggest that the temperature at which charring occurred was around 360°C. The extent and nature of the charring is similar in both the terminals and body of all of the torcs examined (Cartwright *et al.* 2012). Importantly, this suggests that the coiled wire copper alloy torcs were substantially complete (with the terminals attached) before charring of the organic cores occurred. The heating appears regular and controlled, and thus a consequence of an intentional manufacturing process.

This work was published by Cartwright *et al.* (2012) in a paper that focused on characterising the organic cores through optical microscopy (OM) and scanning electron microscopy (SEM), and evaluating the technological advantages provided by the use of such material during manufacture. This chapter presents a summary of that research, and also explores the woody resources available at Snettisham, aiming to understand in more detail why specific trees were selected for torc core wood.

Identifying the organic cores of coiled wire copper alloy torcs through scanning electron microscopy

The first examination of the organic cores was carried out using a JEOL JSM840 scanning electron microscope (SEM) in high vacuum (HV) mode. Imaging of the composite objects comprising copper alloy and charred wood cores was achieved using a scintillator backscattered electron (BSE) detector (K.E. Centaurus®), offset from the electron beam axis to give topographic images that were uncompromised by charging effects. Selected areas were also documented by secondary electron (SE) imaging to show details of cell structures, carefully avoiding any areas with surface charging. Subsequent examination was undertaken using a variable pressure (VP) Hitachi S-3700N SEM for additional imaging of the torcs, for the examination of the uncoated experimentally charred alder specimens (Cartwright *et al.* 2012), and also for the charcoal fragments from the later enclosure ditch (see Chapter 9). VP SEM operating

Accession number	Description	Identification of wood
Snettisham F.168 (BM)	Coiled wire copper alloy torc neck-ring fragment, including terminal	*Acer campestre*, field maple
Snettisham F.167 (BM)	Coiled wire copper alloy torc neck-ring fragment	*Corylus avellana*, hazel
Snettisham F.166 (BM)	Coiled wire copper alloy torc neck-ring fragment	*Alnus glutinosa*, alder
Snettisham F.199 (BM)	Coiled copper alloy torc neck-ring fragment	*Cornus sanguinea*, dogwood
C.27 (NCM)	Coiled wire copper alloy torc terminal fragment	*Salix* sp., willow
C.31 (NCM)	Coiled wire copper alloy torc terminal fragment	*Sambucus nigra*, elder
C.22, C26 (NCM)	Coiled wire copper alloy torc neck-ring fragments, including terminals	*Alnus glutinosa*, alder
C.1–5 (NCM)	Coiled wire copper alloy torc neck-ring fragments	*Corylus avellana*, hazel

Table 19.1 Identification of woody taxa used in Snettisham copper alloy torcs with organic cores

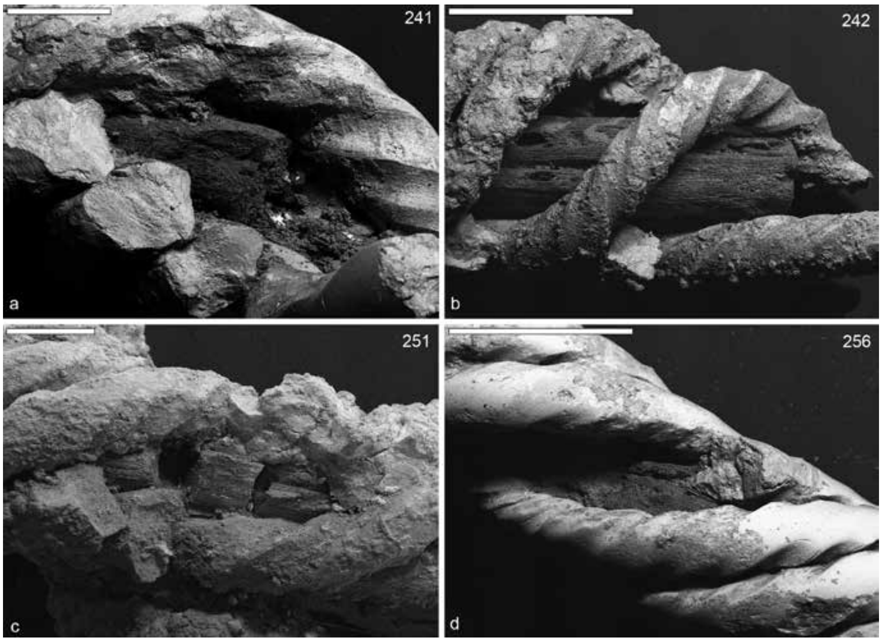
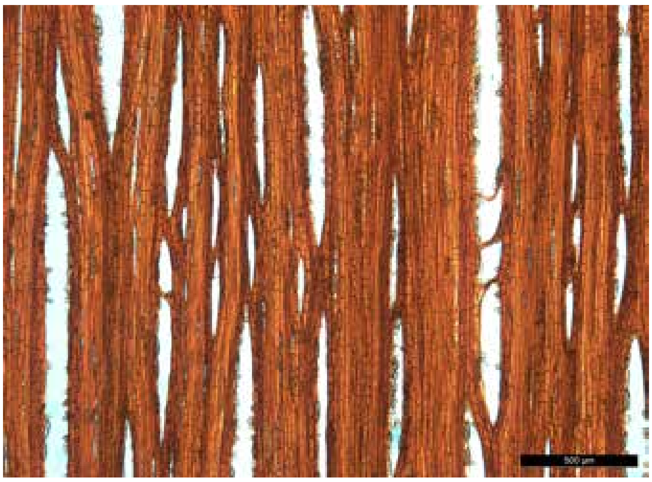


Figure 19.1a–d Four small coiled wire copper alloy torcs in the BM were examined in the scanning electron microscope where the charred wood cores were exposed at fractured ends or by corroded breaks in the metal: a) F.168 (scale bar 2mm); b) F.167 (scale bar 5mm); c) F.166 (scale bar 2mm); d) F.199 (scale bar 5mm)

conditions varied according to the specimen: 15kV or 20kV; working distance from 12.2mm to 21.4mm; magnifications from x70 to x1500 and a chamber pressure of 30Pa. The highly sensitive, five-segment BSE detector on the model of VP SEM used enabled detailed interrogation and imaging of the topography of the charred woods. The 3D mode, rather than Compositional, produced maximum surface topography information in most instances although

Figure 19.2 Optical microscope image of *Tilia* sp. lime bast (inner bark) fibres used as string bound round Snettisham torc G.16



Compositional was used (with 20kV) for the transverse section of the experimentally charred alder samples.

Standard techniques of wood identification and terminology determined by the International Association of Wood Anatomists (IAWA) were adopted in a modified form suitable for archaeological wood, in order to accommodate the effects of charring (Cartwright 2015). Standard protocol requires transverse, radial longitudinal and tangential longitudinal sections/surfaces (TS, RLS and TLS) to be available for species identification using the SEM through fine resolution and high magnification of crucial diagnostic features. However, because the charred wood cores of some of the torcs could only be examined in the SEM in locations where the charred wood cores were exposed at fractured ends or by corroded breaks in the metal (**Fig. 19.1a–d**), certain restrictions to standard identification procedures were present when not all of the three requisite sections (TS, RLS and TLS) were visible. Nonetheless, because of good cellular preservation, sufficient diagnostic features (as described in **Table 19.2**) could be distinguished in each case and secure identifications of the six woody taxa were achieved (**Table 19.1**).

Two of the BM charred wood cores (F.168 and F.167) were sampled for radiocarbon dating carried out as part of the 'Technologies of Enchantment' project (Garrow *et al.* 2009, see **Table 5.2**) thus permitting access to TS, RLS and TLS.

Key diagnostic features	***Acer campestre*, field maple**	***Alnus glutinosa*, alder**	***Cornus sanguinea*, dogwood**	***Corylus avellana*, hazel**	***Salix* sp., willow**	***Sambucus nigra*, elder**
growth ring boundaries	distinct; a few rows of radially-flattened fibres occur at growth ring boundaries	distinct; growth ring boundaries undulate near aggregate rays	sometimes distinct; growth ring boundaries may undulate	distinct; growth ring boundaries may undulate	distinct	usually distinct because of a clear difference in size of earlywood and latewood vessels or of marginal bands of thin-walled vascular tracheids in latewood
diffuse-porous / ring-porous / semi ring-porous	diffuse-porous	diffuse-porous to semi ring-porous	diffuse-porous to semi ring-porous	semi ring-porous to diffuse-porous	semi ring-porous to diffuse-porous	semi ring-porous to diffuse-porous
vessel arrange-ment	widely spaced, solitary, often in short (2 to 4) radial multiples	radial multiples of 4 or more vessels common; clusters in earlywood	generally solitary; mostly similar in size; relatively widely distributed across growth ring	in diagonal (dendritic) and/or radial arrangement, in multiples, radial rows or clusters	solitary or in short radial files with 2 to 3 vessels, occasionally in clusters	thin-walled vessels grouped in oblique / radial / tangential bands or clusters; sometimes dendritic
vessel shape (other than round or oval)		angular solitary vessel outline				angular solitary vessel outline
perforation plates	simple	scalariform	scalariform	Scalariform	simple	simple and scalariform
intervessel pit arrangement	alternate	opposite or alternate	scalariform or opposite	alternate; shape of pits polygonal	alternate; shape of pits polygonal	alternate; shape of pits polygonal
vessel-ray pits	with distinct borders, similar to intervessel pits	with distinct borders, similar to intervessel pits	with distinct borders, similar to intervessel pits	with distinct borders, similar to intervessel pits	large, rounded or angular pits with much reduced borders or apparently simple	with much reduced borders to apparently simple: pits rounded or angular
helical (spiral) thickenings in vessels	present			present		
tyloses in vessels					occasional thin-walled tyloses present	occasional thin-walled tyloses present
fibres	non-septate; thin- to thick-walled	non-septate; thin-walled; fibre-tracheids rare	non-septate; thin- to thick-walled	non-septate; thin- to thick-walled	non-septate; fibres very thin-walled but also some that are thin- to thick-walled	septate and non-septate; thin- to thick-walled;
fibre pitting		with simple to minutely bordered pits or distinctly bordered	with distinctly bordered pits; common in both radial and tangential walls	simple to minutely bordered pits or distinctly bordered; mainly restricted to radial walls	simple to minute-ly bordered pits	simple to minutely bordered pits
axial parenchyma	absent or extremely rare apotracheal diffuse or marginal; scanty paratracheal;	apotracheal axial parenchyma diffuse, or diffuse-in-aggre-gates	apotracheal axial parenchyma diffuse; scanty paratracheal parenchyma	diffuse apotracheal axial parenchyma	sparse apotracheal parenchyma, occasionally terminal / marginal parenchyma in discontinuous uniseriate bands	axial parenchyma absent or extremely rare; scanty paratracheal, diffuse or in marginal bands
rays	mostly 2–4 seriate; homocellular; all ray cells procumbent	exclusively uniseriate; homocellular; all ray cells procumbent	heterocellular; multiseriate rays; mostly 3–5 cells wide; larger rays commonly 4–10 seriate; with 1 to over 4 rows of upright / square marginal cells	1–3 cells wide; heterocellular rays; square and upright cells restricted to marginal rows	uniseriate; heterocellular with square and upright marginal cells	heterocellular; larger rays commonly 4–10 seriate, mostly with 1–4 rows of square and upright marginal cells
sheath cells			present			Present
aggregate rays		present, with bi- to triseriate rays common		present		
calcium oxalate crystals	prismatic crystals in chambered axial parenchyma cells	not observed	not observed	Present	not observed	not observed

Table 19.2 Key anatomical features of the six woody taxa identified in the organic cores of some Snettisham coiled wire torcs

Taxon	Notes
***Acer campestre*, field maple**	**Organic torc core wood.** Makes good charcoal
Acer pseudoplatanus, sycamore	Not a native species; introduced from Central Europe, possibly in Roman period
Aesculus hippocastanum, horse chestnut	Not a native species; introduced from south-east Europe in late 16th century
***Alnus glutinosa*, alder**	**Organic torc core wood; charcoal in Hoard M ingots.** Makes excellent charcoal
Betula pendula, silver birch	Makes high-quality charcoal
Betula pubescens, downy birch	Makes high-quality charcoal
Calluna vulgaris, heather	Can be used for charcoal
Carpinus betulus, hornbeam	Makes exceptionally good charcoal. Hornbeam charcoal present in enclosure ditch
Castanea sativa, sweet chestnut	Charcoal provided good fuel for iron smelting. Chestnut charcoal present in enclosure ditch
***Cornus sanguinea*, dogwood**	**Organic torc core wood.** Makes good charcoal
***Corylus avellana*, hazel**	**Organic torc core wood.** Makes good charcoal. Hazel charcoal present in enclosure ditch
Crataegus monogyna, hawthorn	Makes good charcoal
Euonymus europaeus, spindle	Makes high-quality charcoal
Fagus sylvatica, beech	Makes good charcoal
Frangula alnus, alder buckthorn	Makes high-quality charcoal
Fraxinus excelsior, ash	Makes good charcoal
Hedera helix, ivy	Found as charcoal through secondary usage/burning
Hippophae rhamnoides, sea buckthorn	Can be used for charcoal
Ilex aquifolium, holly	Found as charcoal through secondary usage/burning
Ligustrum vulgare, wild privet	Can be used for charcoal
Lonicera spp., honeysuckle	Found as charcoal through secondary usage/burning
Malus sylvestris, crab apple	Can be used for charcoal
Pinus sylvestris, Scot's pine	Native species, but plantation created to west of site. Can be used for charcoal
Populus alba, white poplar	Not a native species; introduced and planted
Populus nigra, black poplar	Can be used for charcoal
Populus tremula, aspen	Makes good charcoal
Prunus avium, wild cherry	Can be used for charcoal
Prunus padus, bird cherry	Can be used for charcoal
Prunus spinosa, blackthorn	Makes good charcoal
Quercus ilex, holm oak	Makes good charcoal
Quercus robur, pedunculate oak	Makes good charcoal
Rubus fruticosus, bramble	Found as charcoal through secondary usage/burning
Salix alba, white willow	Makes good charcoal
***Salix* sp., willow**	**Organic torc core wood.** Makes good charcoal. Willow charcoal present in enclosure ditch
***Sambucus nigra*, elder**	**Organic torc core wood**
Sorbus aucuparia, rowan	Can be used for charcoal
Taxus baccata, yew	Can be used for charcoal
Tilia cordata, small-leaved lime	Makes good charcoal
Tilia platyphyllos, large-leaved lime	Makes good charcoal
Tilia sp., lime	Makes good charcoal. Lime charcoal present in enclosure ditch
***Tilia* sp., lime**	**String used to wrap around torcs**
Ulex europaeus, gorse	Makes good charcoal, giving off much heat
Ulmus glabra, wych elm	Can be used for charcoal
Ulmus minor, elm	Can be used for charcoal
Viburnum opulus, guelder-rose	Found as charcoal through secondary usage/burning

Table 19.3 Selected woody taxa recorded in and around Snettisham in 1990
Bold: species found in association with torc manufacture and repair or Hoard M ingots
Underlined: species present in Late Roman charcoal deposits in the enclosure ditch (see Chapter 9)

Figure 19.3a–d Vegetation near the Snettisham torc site, including pockets of woodland, hedgerow species, planted poplars and pines

In addition, tiny samples were permitted from the cores of four coiled wire copper alloy torc fragments from NCM, again allowing TS, RLS and TLS examination. For the same radiocarbon dating programme (Garrow *et al.* 2009), Cartwright also identified two instances of the presence of *Tilia* sp. lime bast (inner bark) fibres (**Fig. 19.2**) used as string bound round Snettisham torcs G.16 and L.6, as well as *Alnus glutinosa* (alder) charcoal found embedded in silver and copper alloy lumps/ingots from Hoard M (M.1–M.5). No evidence for torc metalworking activities has been revealed by archaeological excavations at Snettisham (to date), and the presence of metal ingots/lumps associated with alder charcoal does not conclusively testify to silversmithing on site either. It is worth recording on **Table 19.3**, nonetheless, those woods that make excellent charcoal, if only to indicate that excellent charcoal fuel resources were most likely readily available (and were utilised in later periods).

The woody resources of Snettisham

Whilst there is no evidence that the coiled wire copper alloy torcs with organic cores were actually made at Snettisham using local woods, there is no evidence to the contrary either. It follows, therefore, that it is important to understand the preferred habitats of the six taxa present – alder, hazel, dogwood, field maple, willow and elder – to establish whether or not it was possible for the local vegetation at Snettisham to provide sources of the organic cores and string wrappings.

In 1990, Cartwright undertook a survey of the local vegetation in the area of Ken Hill (**Fig. 19.3a–d**). In addition to land given over to farming, it was apparent that the areas of mixed oak deciduous woodland had been replaced to the west of the excavation site by a pine plantation, and to the south by a poplar plantation. Understorey vegetation of hawthorn (**Fig. 19.4**), hazel and bramble (amongst many other taxa) was present in the hedgerows.

The distribution maps and associated data from the Botanical Society of Britain & Ireland (2018) provide a wealth of information about the local woody vegetation in and around the Snettisham area recorded from 1930 to the present day. This is summarised in **Table 19.3**, with notes of uses of these materials seen in the archaeological evidence from the site, and recent introductions that would not have been available at the time of torc manufacture.

Many of these species are present as dominant trees or understorey in primary or secondary mixed oak woodland, largely deciduous in character. However, given the proximity of Snettisham to the coast, some heathland taxa

Figure 19.4 Hedgerow specimen of *Crataegus monogyna*, hawthorn bearing fruit

Figure 19.5 *Sambucus nigra*, elder tree, predominantly found in hedgerows, woodland margins and open areas. Elder tree wood was identified from the core of C.30b (NCM), a coiled wire copper alloy torc terminal fragment

Figure 19.6 *Acer campestre*, field maple; this species of tree was used for the wooden core of torc F.168

are also present. Certain species, notably *Sambucus nigra* (elder) (**Fig. 19.5**) are predominantly found in hedgerows, woodland margins and open areas, often associated with eutrophic (nutrient-rich) or disturbed soil (Atkinson and Atkinson 2002). *Alnus glutinosa* (alder) prefers habitats near streams, often forming pure woods in succession to marshes or fens; it is tolerant of cutting and coppices well.

Although there may be no direct significance, it is interesting to note that four of the six woods used for torc cores were selected from useful fruit-bearing trees (**Figs 19.4–5**). If some form of woodland management had been present, both for coppicing young stems and for harvesting of fruits, this may (in part at least) explain the use of these species. However, the different wood properties of the selected species (frequently found in association with one another) are likely to have been the crucial determining factors.

Field maple (*Acer campestre*), a wood with good bending properties, was used for the core of torc F.168 (**Fig. 19.1a**). When coppiced, *Acer campestre* (**Fig. 19.6**) tends to remain as a shrub. The cores of torc F.167 (**Fig. 19.1b**) and C.1–5 were of hazel (*Corylus avellana*) wood, which has excellent flexibility and resists compression and fracturing well (Özden *et al.* 2017). Although for an entirely different function, it is informative to see a photograph showing the extent to which hazel wood can be twisted and bent back on itself in the formation of broches (or spars) used in thatching (Forestry Commission 1956, pl. 23). Alder (*Alnus glutinosa*) wood, whose properties include good elasticity, was selected for the cores of torc F.166 (**Fig. 19.1c**) and torc fragment C.22 and C.26. The core of torc/bracelet F.199 (**Fig. 19.1d**) is dogwood (*Cornus sanguinea*), another highly flexible wood (often used in basketry). If coppiced regularly dogwood will produce long straight stems after being cut back (**Fig. 19.7**). The two cores of C.27 and C.31 are samples from torc terminals rather than from coiled wire copper alloy bodies (C.27 and C.31 in **Table 19.1**). Their cores have been identified as consisting of willow (*Salix* sp.) (**Fig. 19.8**), and elder (*Sambucus nigra*) wood. Willow wood is light and, whilst it can be bent easily, it will ultimately buckle (Van Casteren *et al.* 2012). Like willow, elder wood is noted for its elasticity. Not only does coppicing promote growth of new, slender, flexible stems – ideal for use as organic cores in torc manufacture – it also contributes to the rotational harvesting, maintenance and management of healthy woodland and field hedgerows (Buckley 1992). Land management of woodland and hedgerow resources, in addition to meadows and heaths, has contributed to the rich diversity of Norfolk's vegetational communities over the centuries (Norfolk Biodiversity Partnership 2006), most likely over the millennia, in fact. There is clear survival of pockets of ancient woodland, which Barnes and Williamson (2015) define as consisting of long-established semi-natural woods, shaped by centuries of traditional management. Nowadays in Norfolk woodland distribution, structure and composition is threatened by overgrazing, agriculture, invasion by non-native species, creation of conifer plantations, trees disease and dieback, recession of traditional practices of woodland management, as well as urban, road and recreational developments and quarrying (Norfolk Biodiversity Partnership 2006), although there have been recent attempts to regenerate environments through rewilding (https://wildkenhill.co.uk).

The materials used for the torc cores and associated string are typically found in primary or secondary mixed oak woodland and field hedgerows. As seen in **Table 19.3**, these types of vegetation are characteristic of Snettisham and its environs today, and there is no evidence to suppose that such vegetation was markedly different in the Iron Age. Elsewhere in southern England, palynological studies and

Figure 19.7 Young shoots of *Cornus sanguinea*, dogwood; this species of tree was used for the core of torc/bracelet F.199

Figure 19.8 Young growth of *Salix alba*, white willow; *Salix* sp., willow wood was used for the core of C.30a (NCM), a coiled wire copper alloy torc terminal fragment

investigation of waterlogged remains have suggested the presence of well-established hedgerows as early as the Bronze Age (Allen and Robinson 1993; Evans and Hodder 2006; Greig 1992; Taylor 1996; Wiltshire 2003; Wright *et al.* 2009, 71–2). Locally available woody resources could therefore have been utilised. However, similar vegetational communities were probably common across much of Britain and western Europe, and so the use of these materials does not help to narrow down the possible manufacturing location for the torcs.

Using the woody resources for torc cores

The team of Snettisham colleagues at the BM has been endeavouring to understand the technological processes involved in using a central core of wood for some types of torc (Cartwright *et al.* 2012) and see Ch. 17). It seems that by using a central core of thin, flexible wood the metalsmiths could prevent multiple copper alloy wires from collapsing in on one another during coiling to form the composite 'hollow' body of the torc. Such a core would also have played an important part in avoiding wire collapse or distortion during the stage at which the torc was bent into its final curved shape. As a result of heating processes during the finishing of the torcs, the fresh wood became charred. Although not fully annealed, it is possible that the torcs were gently heated after the coiling and/or bending processes (Cartwright *et al.* 2012). There was no need to remove the cores once their primary support function had been fulfilled; in fact, it may not have been possible to remove them. These cores are only visible now due to the fragmentation of the copper alloy torcs. Although they now have the superficial appearance of being charcoal, they should be categorised as charred wood.

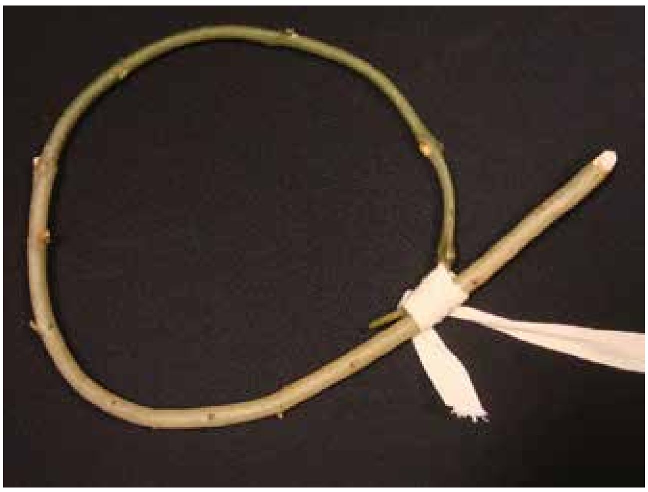
The scientific evidence provided by the wood identifications reinforces the importance of the material properties of alder, hazel, dogwood, field maple, willow and elder. It is clear that the use of organic cores was an integral part of the manufacturing process during the coiling of some of the copper alloy wire torcs (Cartwright *et al.* 2012). It is interesting to note that for making willow baskets, slender branches from the first year's growth are the most suitable as these are very supple and have not yet developed the hard woody bark of second year growth, which renders the branch much less supple. Moreover, first year willow branches have bark that peels easily in early spring, just after the sap starts to flow. No bark was visible on the torc cores; this either signifies (1) that the bark was peeled off prior to curving the slender branch in a circle to form a core, or (2) that the thin layer of bark charred through and disintegrated when heat was transferred to the wood from the coiled wires. The best willow rods for basket-making are long, thin and pliant, have small pith relative to xylem, and are of uniform diameter along their length. Some willow rods (osier wands) are used freshly cut ('green'), some are used in 'semi-green' state, and some are soaked before weaving into a basket (Basketry and Beyond 2012). There is no direct evidence of basket-making employing the same methods as used for torc cores, but the similarities of raw materials and their working properties are worth noting, nonetheless and could imply some cross-over or borrowing of craft techniques.

Figure 19.9 New-growth hazel shoots 2mm to 2.7mm in stem diameter for experimental bending

Figure 19.10 Variable pressure scanning electron microscope image of the freshly peeled surface of a 2.7mm-diameter hazel stem revealing the tangential longitudinal arrangement of cells

Experimental bending of new-growth hazel shoots 2mm to 2.7mm in diameter (**Fig. 19.9**) was carried out by Cartwright in August 2018, and VP SEM examination of a freshly peeled 2.7mm stem followed the day after cutting. These narrow stems were highly flexible and almost impossible to snap without much force being exerted in a twisting motion. As there was no woody bark present, peeling the freshly cut 2.7mm stem was easy, revealing the tangential longitudinal arrangement of cells in the VP SEM (**Fig. 19.10**). Whilst it is understandable that peeled willow osiers would slide more easily over one another during the process of weaving a basket, there seems no obvious reason for peeling any of the thin stems used for the torc cores. Three more hazel shoots formed part of the extended experiment. Cut early in the morning on 8 August 2018, the three stems, which measured 10mm, 7mm and 4mm in diameter, were bent and tied four hours later in a roughly circular 'torc-friendly' shape to compare with the 2.7mm stem diameter. One of the 4mm stem diameter shoots was so flexible that the ends could be roughly knotted together (temporarily) without the shoot breaking. All the examples displayed a decreasing stem diameter size towards the tip of each shoot. All the hazel shoots (of different stem dimensions) were extremely pliable, and could be bent into a torc-like shape with no difficulty, even the 10mm diameter hazel shoot, although this specimen was slightly less flexible and did require some effort to hold the ends together for crossover binding (for expedience, with a modern cotton tie instead of a lime bast fibre one). Aligning the cut shoot ends in a parallel formation enabled a tighter tying attachment than placing the shoot ends at right angles to one another – although both orientations worked successfully (**Fig. 19.11a–b**). However, for making a Snettisham coiled wire copper alloy torc, it is not clear whether the wood shoot needed to be curved into a semi-open or closed circular shape *before* the copper alloy wires were coiled around it, or whether the wires were coiled around a straight (but flexible) wood shoot and then the composite artefact (copper alloy wires coiled around wood) was curved into the requisite torc shape with a gap left between each terminal so that the torc could be used as a slightly 'adjustable' neck-ring. From these experiments, it is possible to suggest that it would be very simple and quick to create a suitable shape for the torc-making process by selecting a freshly cut hazel shoot with a uniform diameter, ideally between 3mm and 7mm in width. Having cut the shoot, no major preparation would be needed, just stripping off any leaf

Figure 19.11a–b New-growth hazel stems: aligning the cut shoot ends in a parallel formation (a) enabled a tighter tying attachment than placing the shoot ends at right angles to one another (b)



stalks present. These experiments were extended to the other species represented in the torcs – alder, dogwood, field maple, elder and willow in order to evaluate whether, given their similar wood properties (outlined above), they would produce comparable results, which they did.

Consideration must be given as to whether the use of organic cores represents a widespread technological innovation or the product of a single workshop (local or distant). This is difficult to evaluate given the fact that so few wooden (or other organic) cores have been preserved in the archaeological record. Evidence is emerging for wooden withies being used in Iron Age cauldron rims, so this manufacturing method may have been more widespread than thought hitherto (Baldwin and Joy 2017, 40, fig. 46, 89–91, table 12; see also Gerlof 1986). Preservation mostly occurs either through the object and its organic component(s) having been charred, or the wood core being in close association with metalwork and its corrosion products. Some other artefacts, such as Bronze Age gold lock-rings, also display wood cores (La Niece and Cartwright 2009). Although no wooden cores were observed in the Snettisham gold alloy wire torcs, these could have been removed before the terminals were affixed to the neck-ring. It seems no single hypothesis can cover all the metallurgical and technological complexities involved.

Conclusions

It is clear that although the torc cores are now preserved in charred condition, originally it is most likely they were slender wands of fresh (possibly coppiced) wood with sufficient flexibility to provide the appropriate support during construction of these torcs. Central to this evaluation has been the SEM identification of the woody taxa and consideration of their physical characteristics for their role as core material. Making comparisons with experimentally fired examples in an earlier study (Cartwright *et al.* 2012) allowed the charring temperatures of the archaeological material to be determined, at around 360°C. The charring seems to have occurred after the manufacture of the torc was largely complete, reflecting a regular and controlled heating process applied to both the neck-ring and terminals. Whilst it cannot be unequivocally concluded that the managed mixed oak woodland and hedgerows at or around Snettisham itself provided the resources needed, the evidence of these types of vegetational communities being the source of such materials is not in dispute.

Chapter 20
Torc Biographies

Jody Joy, Nigel Meeks and Julia Farley

In this chapter we examine torcs for details of how they were worn, as well as the intensity and duration of usage, such as patterns of polishing, wear and repair. Our aim is to piece together information written into the artefacts throughout their lives to help inform torc biographies (cf. Kopytoff 1986; Gosden and Marshall 1999; Joy 2009a). In addition, many torcs show signs of deliberate breakage prior to burial, as well as other forms of alteration such as heating and melting. Some were even broken and joined or linked together with other objects, creating new artefacts or assemblages. Detailed information listing evidence for wear, damage and repair appears in individual catalogue entries in Chapter 14. The following account summarises patterns and observations, before this information is drawn together to consider implications for the life trajectories of torcs: how long they were in circulation and the identification of potential life-paths.

Systematic study was made of all torcs and torc fragments, involving visual inspection as well as closer examination of areas of interest using optical as well as, in some cases, scanning electron microscopy. Evidence for wear included polished and smoothed surfaces where torcs had come into contact with skin or clothing, scratches, general wear and tear, breakage and repair.

Evidence of use wear, damage and repair

Most of the torcs showed some evidence of the characteristic features of wear, which is important because it demonstrates that they were not made especially for deposition: they had use-lives before they were deposited. In some instances, objects were probably very long-lived. A difference in wear patterns was also noted between tubular and multi-strand torcs. Many wire torcs of all sizes showed extensive evidence of wear from their use in antiquity. In contrast, some of the large tubular torcs show only limited evidence of wear. Perhaps, as these objects were manufactured from thin gold sheet, they would not have stood up to the mechanical wear, abrasion and knocks that would inevitably occur through daily usage. They may therefore have been reserved for special occasions.

Tubular torcs

Owing to the fact that many tubular torcs were found in a crushed state, which may be in part a product of post-depositional damage, finding extensive evidence for wear and repair on these objects proved to be quite difficult. Nevertheless, where they are relatively undamaged, such as the examples from Hoard A, it appears that tubular torcs were relatively lightly used when compared to multi-strand torcs.

Tubular torc A.1 has a repair patch soldered in place in antiquity, with decorative circles (see Ch. 21) punched over the repair (**Fig. 20.1**). This might imply that it was repaired at the time of manufacture, perhaps due to a thinning or tear in the metal. While the present state of the torc is a little dented, it does not seem to have much additional evidence of use wear.

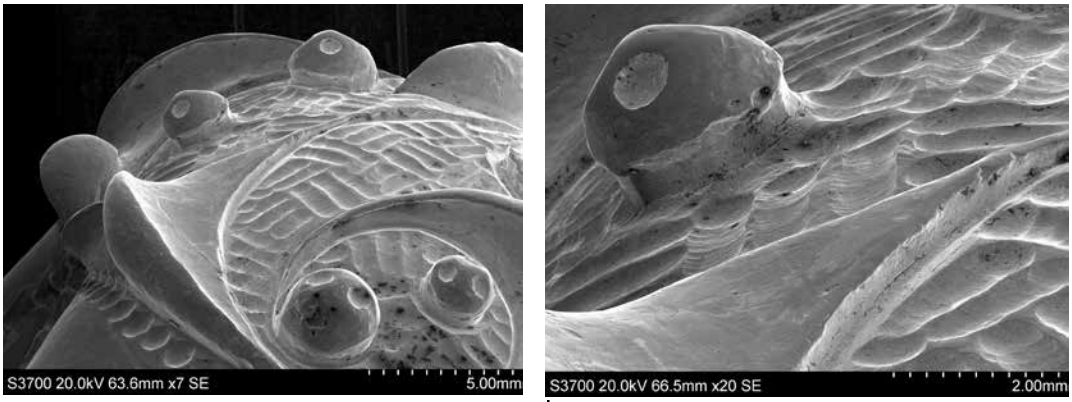
Multi-strand torcs

Wear on multi-strand torcs can be seen on the exposed surfaces of the wires of the neck-rings and on the protruding design features of terminals that have been subject to

rubbing on clothes, or the body, or possibly even during storage (**Fig. 20.2a–b**). Wear also resulted from general wear-and-tear such as putting torcs on and taking them off.

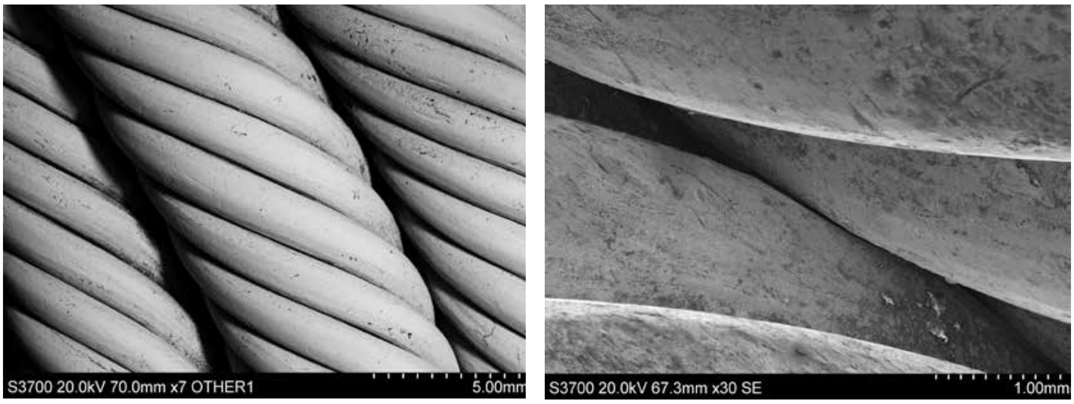
Tightly coiled ropes made from multiple wires often show a high level of wear, with grooves worn into adjacent wires at the points of contact and friction. This pattern of wear is indicative of prolonged usage. The flexing of putting torcs on and taking them off and movement from frequent wearing resulted in the characteristic wear patterns illustrated in **Figures 20.3–4**, which show the worn wires of comparatively stiff neck-rings. When new, the wires would have had prominent linear facets running all the way along their lengths (cf. Ch. 17, e.g. **Figure 17.14a–d**, showing torc fragments S.31–9; **Figure 17.20a–b**). While these facets have been preserved in certain protected areas, they have been polished smooth at the points where wires have rubbed together, or on the outer faces, where they would have rubbed against clothing or the body, or been susceptible to polishing.

Figure 20.1 Repair patch soldered onto large tubular torc A.1



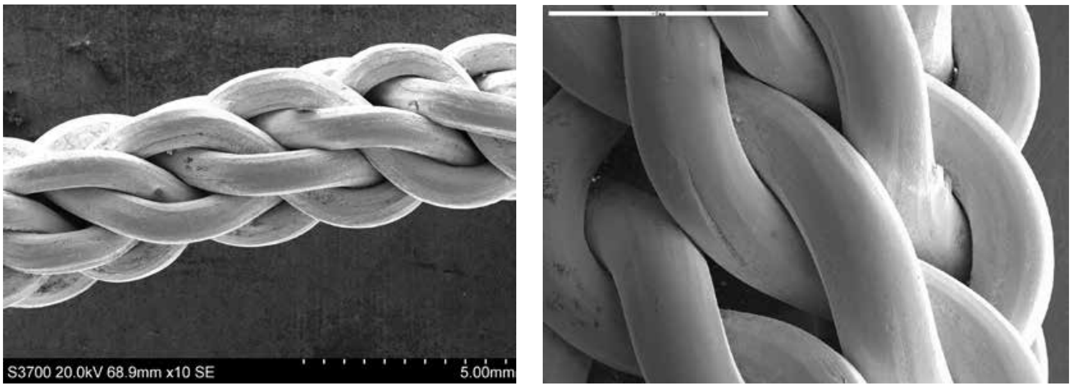
a b

Figure 20.2a–b SEM details of one of the terminals of the 'Great Torc' (E.1a), showing rounded polish on prominent features



a b

Figure 20.3a–b SEM images: left, wear and polish on the Great Torc neck-ring wires has worn away the linear facets on exposed outer surfaces, but not in protected regions between wires; right, detail of the friction zone between adjacent wires, with significant wear from one wire creating a curved groove in the adjacent wire (centre of image)



a b

Figure 20.4a–b SEM images of a stiff multi-strand torc F.116 (left), and detail of similar torc L.16 (right), showing wear patterns between tightly fitting adjacent wires, and smoothed surfaces at prominent outer points. For F.116, contrast the worn areas with protected parts of the wire, where linear facets are still visible

a b c

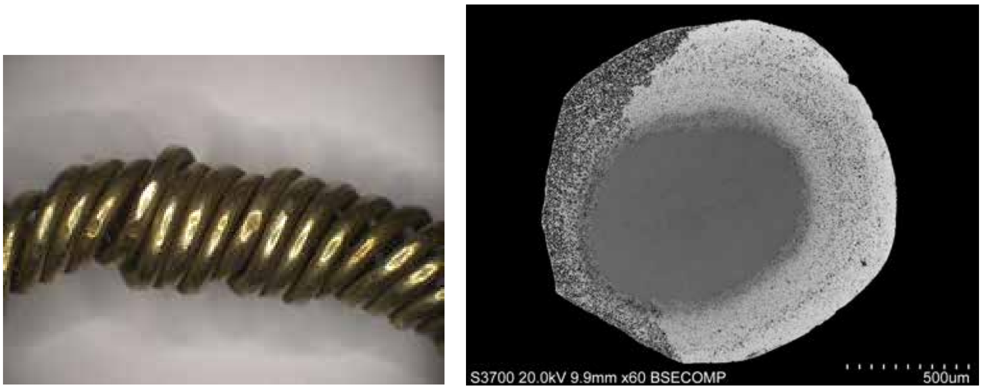
Figure 20.5a–c Extreme wear between the very flexible, springy wires of torc L.17. In some areas flat areas have been worn (centre), and in others the wires have created grooves (right)

a b

Figure 20.6a–b Torc L.21a, with protected wires retaining their surface facets, while heavily worn surfaces reveal the coppery-coloured core metal (right)

a b

Figure 20.7a–b Torc L.1, showing extensive wear on and between wires, giving a flattened appearance to the surface of the neck-ring ropes

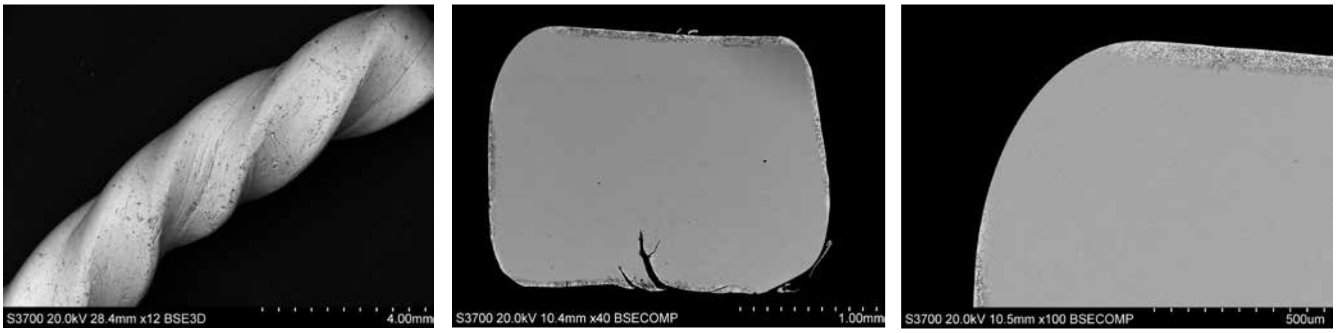


a b

Figure 20.8a–b Small torc F.88, a fragment of tightly coiled wire neck-ring. The SEM cross-section image (right) shows the heavy wear cutting through the original surface enrichment on the left side of the wire

The more flexible the torc, the more wear is seen between the wires. For example, **Figure 20.5a–c** shows how worn the wires are on the very springy and flexible multi-strand torc L.17. In some instances, adjacent wires have worn the corners of the square-section twisted wires completely flat (**Fig. 20.5b**), whereas in other areas deep grooves have been worn into the adjacent wires (**Fig. 20.5c**). Similarly, other multi-strand torcs such as torc L.21a (**Fig. 20.6a–b**) and L.1 (**Fig. 20.7**), which are also quite flexible, have extensive wear on the surfaces of the outer wires. On L.21a, polishing has even worn through the silvery-gold surface-enriched layer, exposing the coppery-coloured core.

The size of torc does not seem to have had a bearing on patterns of wear. Both large and small torcs are equally affected, although the effects of wear may have been more pronounced on examples where neck-ring wires were



a b c

Figure 20.9a–c Twisted square-section wire F.429, with very worn exposed corners. Originally this wire would have been square in cross-section; the heavy wear on the corners has polished through the outer surface-enriched layer

Figure 20.10 Torc L.1, showing an area of cast-on repair to a large cold-shut on the original terminal casting

Figure 20.11 Terminal of torc L.21a, with a massive cold-shut casting defect

thinner. On larger objects, such as L.1, the exterior wires (originally circular in cross-section) are polished down to a flattened oval (see **Fig. 20.7a–b**). On some smaller torcs and bracelets such as F.88 (**Fig. 20.8a–b**), the original round wire has been so heavily worn that abrasion has cut deeply through the thick original surface-enriched layer. This has allowed corrosion to penetrate deep into the interior as the protective burnished gold-rich outer surface region has completely worn away.

Some individual wires also show heavy wear. The square-section twisted wire F.429 is typical, the exposed corners of the square wire having worn smooth, right through the original surface enrichment (**Fig. 20.9a–c**). Note also on this wire the longitudinal groove along the centre-line of the two faces. This groove is also seen in cross-section, where it cuts deeply into the wire's core. This would appear to be the result of a hammered fold where the two edges met but did not become hammer-welded together, demonstrating how vagaries of manufacture can affect patterns of wear. The difference between worn square-section wires with rounded corners and those which have been protected enough to keep their sharply squared ridges can be seen near the collar of the 'Grotesque Torc', L.19 (see **Fig. 17.99a–b**).

As seen with tubular torc A.1, repairs to rectify manufacturing errors are also present on some cast terminals. For example, a terminal of torc L.1 shows a cast-on repair where additional metal has been added to close a large cold-shut (mis-casting hole) (**Fig. 20.10**). The repair seems to have been successful and is firmly attached. The irregular outline suggests the repair may have been cast-on then polished before a decorative groove was finally added. But manufacturing errors were not always rectified. The cold-shut hole at the end of one of the terminals of L.21a was left unrepaired (**Fig. 20.11**).

Other torcs appear, to modern eyes, unfinished. For example, whilst in most cases cast-on terminals were cleaned, hammered and polished, and had the projecting sprues from the casting process removed, they remain present on torc S.17 (**Fig. 20.12**). The only torc with clear 'hook' terminals, H.3 (**Fig. 20.13**), has hammered wire terminals dis-similar to any other complete torc. These may have been being prepared for the casting-on of additional metal to create a thickened ring terminal.

Areas of wear, vulnerability and repair

Looking at the areas where wear occurs most often, it is possible to make inferences as to how torcs were taken on and off and also to estimate how often this happened. In effect it is a crude measure of usage as similar wear patterns could result on the one hand from a relatively short period of heavy use, or on the other from a much longer, less intense, use-life.

Many examples of complete torcs have raised or broken wires at the very back of the neck-ring. In a few cases, such damage has required repair. Copper alloy torcs G.16 and

Figure 20.12 The sprues from casting-on the thickened ring terminals have been left in place on torc S.17

Figure 20.13 The hammered ends of hook terminal torc H.3 may represent unfinished terminals which had been prepared for the casting-on of additional material to create a thickened ring

L.6 have both been bound around with organic 'string' at the back of their neck-rings to reinforce the wires. Two more heavily worn torcs which broke entirely at the back (L.19 and L.20) are discussed in more detail below.

The join between the terminal and the neck-ring also seems to have been unreliable. Even among torcs which remain relatively undamaged, some, such as E.1a (Great Torc), show evidence for stress and cracking around the joins between terminal and neck-ring (**Fig. 20.14a–b**). In other cases, greater breakage has occurred. For example, attempts were made to fix the join on one of the ring terminals of L.21a, which has been secured to the neck-ring using strands of wire looped through the neck-ring at one end and the terminal loop at the other (**Fig. 20.11**). It is unclear whether the terminal was ever completely detached, but if this had happened, we might expect that the springy wires of the neck-ring would have unravelled somewhat more than appears to be the case. Torcs L.12 and L.13 are both missing buffer terminals which appear to have become detached during the life of the torc. On L.12 the break is very clean and it is possible that the terminal was cut off in antiquity, or perhaps the broken area was trimmed after breakage occurred. Similarly, on L.13 the wires also appear to have been cut, either to remove the missing terminal or in an attempt to tidy the break. On L.12, the wires of the neck-ring remain tightly coiled, but L.13 has begun to uncoil, the wires becoming more disorganised. Copper alloy torc G.13 has also lost a terminal, and in this case the open ends of the wires have been bound with an organic repair, perhaps to prevent uncoiling of the wires. On torc L.20, the three pieces of wire used to 'repair' the heavily broken neck-ring pass through holes in the terminals (as seen on L.21a) and may also function to reinforce the join between terminal and neck-ring.

Piecing all of this evidence together (and assuming damage has occurred on torcs where they have been most heavily strained during use) it appears that putting a torc on involved pressure on both the back of the neck-ring and the join between the terminals and the body of the torc. The most likely explanation is that the terminals were first pulled apart, with one terminal pulled forward and possibly slightly upwards to create a sufficient gap to allow it to be twisted on around the neck. They were likely removed in a similar fashion. This has left some torcs, including the 'Great Torc' (E.1a) permanently deformed, with one terminal pulled slightly higher than the other. Interestingly, when viewed from above it is the unrepaired terminal on L.21a which is furthest forwards, suggesting that whoever wore it was careful not to put unnecessary pressure on the opposite terminal where the join with the neck-ring had been reinforced.

Patterns of wear can also be seen on multi-strand torcs from other sites, though there appear to be some differences in the treatment of these objects. For example, the Newark, Nottinghamshire, Torc (see **Fig. 17.102**) has one terminal higher and further forward than the other (cf. Joy 2016), like many of the Snettisham torcs. In the case of Newark, polishing and wear on the terminals is more marked on one side, implying the torc was consistently worn the same way up. When oriented with the polished side down as the torc was worn, the terminal furthest forward is the right-hand terminal. This implies that the person/s who wore it were right-handed. This could indicate it was worn by just one person, or perhaps that there was a 'correct' way for the decoration on the terminals to be oriented. Wear patterns on other torcs, such as the largely undecorated examples from Leekfrith, Staffordshire (Farley *et al.* 2018), also seem to show a preferred orientation. In contrast, the decoration on the terminals of torcs from Snettisham appears equally worn on both sides, suggesting there was not one appropriate orientation in which their decoration should be viewed. Similarly, undecorated terminals from the site can also show polishing and wear on both sides.

The wear and repair on torc L.19 (**Fig. 20.15**) is probably the most obvious and striking on any of the torcs known from Britain. Certainly, the repairs are highly visible and seemingly rudimentary (cf. Joy 2019a), but patterns of wear also closely match those identified on the other torcs. At some point in its history, the join between one of the terminals and the neck-ring has been reinforced (similar to repairs seen on L.20 and L.21a). This was achieved using a length of crudely cut metal ribbon which has been wrapped several times around the neck-ring and looped through the hole at the centre of the doughnut-shaped terminal. A second piece of metal ribbon was coiled around the neck-ring at the back of the torc. It is so similar to the ribbon holding the terminal in place as to indicate that the two repairs may have been executed at the same time. It is difficult to be certain whether the terminal ever became

a
b

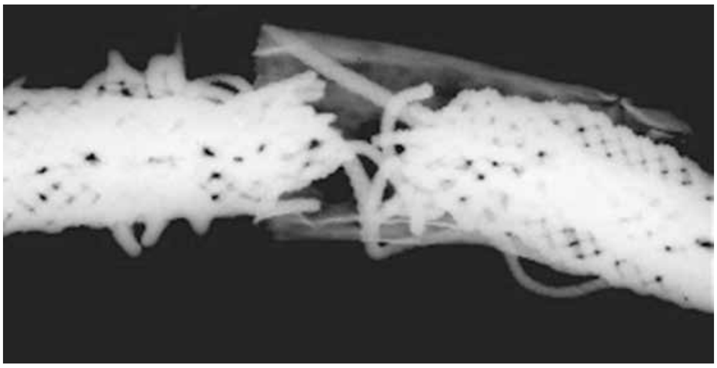
Figure 20.14a–b SEM images of the fatigue cracks across the thick gold flange covering wires on the terminal of the 'Great Torc', E.1a

fully detached but, unlike L.21a, the neck-ring is only very loosely twisted. This could have resulted through prolonged use but may also have been exaggerated if the terminal was at some point completely detached from the neck-ring. A further addition to torc L.19 is part of a multi-strand torc or bracelet which has been passed through the central hole of each terminal. This may have been looped through the terminals at or near the time of deposition, but it could also have served a practical function as a clasp to hold the terminals together when the torc was worn. The tension of the coiled neck-ring wires gives a torc its shape. As the neck-ring of L.19 has lost so much of this tension, perhaps looping the bracelet through the terminals helped hold them in place at the neck when the torc was worn.

As is dramatically shown in a radiograph of torc L.19 (**Fig. 20.16a–b**), at some point in its history the neck-ring broke completely in two. The break occurred at exactly the point of greatest tension when torcs were taken on and off, at the very back of the neck-ring. This implies the breakage could have occurred through the wear and tear of being repeatedly taken on and off rather than as a result of deliberate damage. Perhaps it was weakened in this area through heavy usage and finally broken by accident or through heavy handling, but it is impossible to be certain without disassembling the torc. There is certainly no evidence for the broken ends being neatly cut as a group, as seen on some undoubtedly deliberately fragmented torcs (see below). The neck-ring was repaired by taking a fragment of tubular torc and slotting the broken sections of the neck-ring into opposite ends of the tube. The join is secured rather loosely, without solder (**Fig. 20.16a–b**). It has been reinforced using lengths of twisted wire (perhaps sourced from the neck-rings of decommissioned multi-strand torcs) which were threaded through the cavity in the tubular torc and were then interwoven with the four ropes of the neck-ring. One of these wires also loops through the ring of a

Figure 20.15 Torc L.19, the so-called 'Grotesque Torc'

a



b

Figure 20.16a–b Radiograph of torc L.19 showing central break and wrapped sheet repair at the back of the neck-ring (Radiograph, Janet Ambers)

terminal, as already discussed, further securing it to the neck-ring. At least one of the gold alloy wires underlies the metal ribbon also used to secure the join between the terminal and neck-ring, whereas others are twisted around it.

In summary, L.19 was extensively repaired in antiquity. It was probably wearable, but the repairs are mechanically rather insecure. It is possible it was fixed in one episode using materials to hand at the time. The repairs certainly have an ad hoc appearance. If this were the case, the repairer must have had 'scrap' components readily available. Alternatively, it could have been repaired a number of times but, as the various wires and ribbons have been threaded through and wrapped around each other so extensively, it is impossible now to unravel the precise sequence of the repairs or when exactly they took place, presumably towards the end of the torc's life. Machling and Williamson (2020a) have argued that, rather than being functional, the extensive repairs to this torc were carried out at or near the time of deposition, with the intention to make the torc look as close to complete as possible when it was deposited in the ground. This is perfectly possible, although it is worth noting that the repairs to the torc also meant that it could still have been worn. If the intention was simply to deposit the torc, why use a fragment of tubular torc to join the two broken ends of the neck-ring when they could easily have been reunited through their close placement together in the ground as the two ends of the broken neck-ring of L.20 (see below) were in the same hoard?

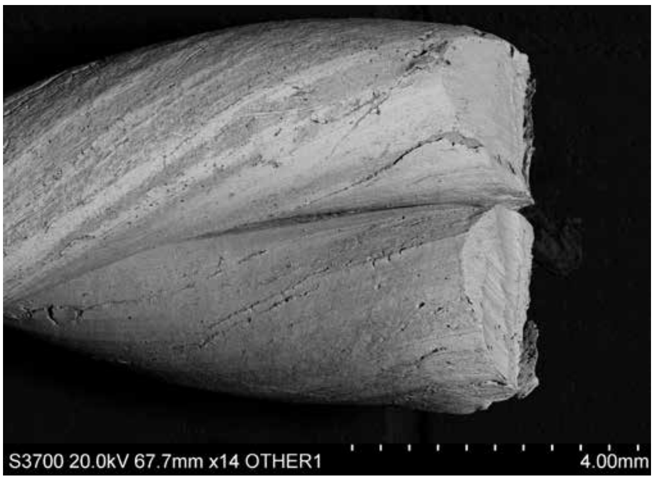
Few torcs damaged this extensively were repaired. The only other 'complete' torc which shows a comparable degree of wear and breakage is L.20 (see **Pl. 14.59**), which is also broken at the back. It has similar additional wires running along the neck-ring; in this instance they pass through holes in the sides of the terminal collars and are then wrapped around the coiled wire cables of the neck-ring, probably reinforcing the terminal joins. The neck-ring itself is missing several cables and completely broken into two pieces, though (unlike L.19) it has not been repaired at the back. The added wires could perhaps have been used to join the two halves (one ends in a neat loop). But, even with these repairs, the torc is so broken that it is hard to imagine how it could have been worn. It was deposited in two halves. Looking at the broken ends, there is no evidence for deliberate cutting of the wires, so it is probably most likely that it was fractured through heavy use and/or by accident. Either way, a repair was theoretically possible, but for some reason was not attempted. Whenever the torc was broken, the halves were retained together, and the object was deposited 'whole'.

Cut and broken torcs

Many of the artefacts from the fragmentary hoards, particularly Hoard F, are damaged or broken. Close

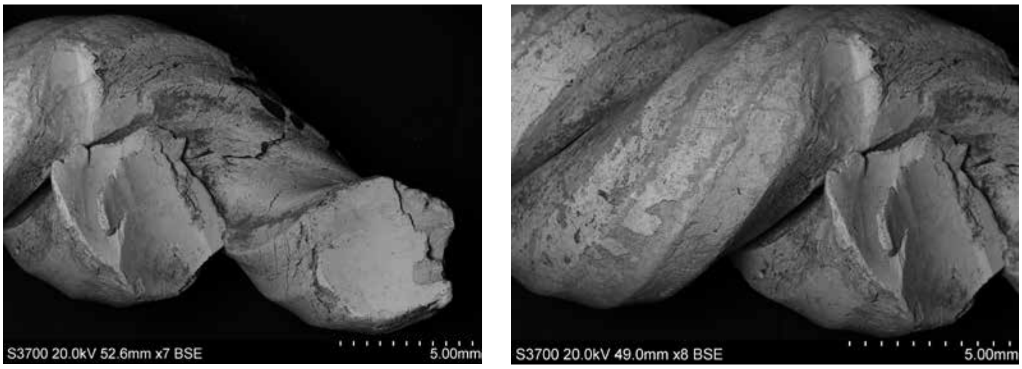
Figure 20.17 Small multi-strand torc fragment F.96, showing the cut ends of the wires

Figure 20.18 The ends of experimental wire (produced by John Fenn) cut using a double-bladed wire cutter (SEM image)



a b

Figure 20.19a–b Detail of cut end of half torc L.16 (left) and SEM detail (right) of similar cut wire ends on torc F.116



a b

Figure 20.20a–b SEM images of the ends of torc fragment F.77, whose thick wires were deliberately cut through by chisel blows

examination has revealed that much of this damage was deliberate and ancient and not accidental, as can occur when torcs are uncovered by ploughing for example (e.g. the Sedgeford Torc), or through burrowing (as seen on many of the Hoard G torcs). It is interesting that coins in the fragmentary hoards also seem to have been treated like objects in this sense, being cut (e.g. no. 174, from Hoard F) or hammered flat (nos 11–12, from Hoard B). The treatment of the coins from the hoards is discussed in detail in Chapter 15.

A number of damage patterns were identified amongst the hoard objects and stray finds. Torcs of various sizes, wire thicknesses and alloy colours were deliberately bent or cut. For example, **Figure 20.17** shows one end of a short length of multi-strand neck-ring (F.96); note the characteristic sloping, clean-cut ends. In this case, the wire metal is sound and in excellent condition, therefore an apparently serviceable torc has been deliberately rendered unusable. As a comparison with the cut wires of F.96, a test cut was made on one of the experimentally made copper wires of similar diameter (Ch. 17), using a double-bladed wire cutter. The cut ends (**Fig. 20.18**) show the same double-sided cut with a central ridge, suggesting that F.96 was most likely also cut with a double-bladed tool, such as a pair of shears.

Other torcs, such as L.16, have been cut in half (**Fig. 20.19a**). This is quite an elaborate object that seems to be otherwise undamaged and has been deliberately and cleanly cut through at the mid-point. Similarly, torc F.116 (**Fig. 20.19b**) has had its terminals cut away, leaving only the neck-ring.

Some of the thickest multi-strand torcs have been cut through by heavy blows from a chisel (**Fig. 20.20a–b**). Numerous short pieces (*c.* 20mm long) of similar thick rods from multi-strand torc neck-rings were found (e.g. **Fig. 20.21**). Their similar lengths suggest that cutting was intended to produce fragments of a uniform length or weight which might have had other uses beyond recycling. One piece was in the process of being cut into smaller sections with a deep cut half-way through the thick twisted wire, about one third of the way along, but the final blow to separate the pieces was not done (**Fig. 20.22**). As well as cutting the torcs with shears and chisels, there are numerous deliberately bent, kinked, and folded wires and torc fragments. Others have been twisted to destruction. There are also cut, flattened and crushed sheet pieces (e.g. **Fig. 20.23**), many of which are probably parts of dismantled and broken-up tubular torcs.

Fusing

Hoard F in particular not only contains numerous fragments of broken torcs, wires and sheet, but some are partly fused together or have droplets of solidified molten metal on their surfaces (e.g. F.32–F.44; see **Pls 14.22–3**). Either a molten alloy was splashed or poured onto these fragments, or very localised heating was applied (likely by blow pipe) that only melted the component with the lowest melting point and was stopped before the rest of the wires were fully melted. Machling and Williamson (2020a) have also theorised that these part-melted pieces could have been part of a failed melt or that spatters of molten droplets could have been caused by a failed casting in the vicinity of these objects. This is possible in some instances, although the frequency and nature of this phenomenon suggests that it very probably was not all accidental and other processes were involved.

One compact assemblage has cut gold wires with gold droplets partially melted and fused onto a shapeless copper-rich alloy lump (**Fig. 20.24**). Another example is the assemblage F.40 (**Fig. 20.25**) which is made up of a long, thick wire bent into a loop and folded back on itself with two

Figure 20.21 Chiselled torc wire (S.42), *c.* 9mm in diameter

Figure 20.22 Thick torc wire fragment (F.75), with chiselled ends and deep incomplete cuts in the centre

Figure 20.23 Cut, crushed and folded sheet fragment from dismantled tubular torc (F.52)

Figure 20.24 Conglomerate of part-fused wires and molten blobs of mixed alloys (S.134) (width of object 25mm)

Figure 20.25 Fused wires and fragments on F.40

twists. At one end there is a part-fused blob containing square-section wire and dribbles of molten gold. The bent, thin tubular torc F.42 (**Fig. 20.26**) has a broken wire torc fragment lying across it; the join is well fused and there are also splashes of molten gold on the tube and wire. Torc fragment F.34 is formed of round-section wires which have been cut at one end, whereas on the opposing side there is a semi-fused mass made up of wires from the torc plus other square-section twisted wires melted onto it (**Fig. 20.27**). Hoard F (and stray finds e.g. S.11a–b, S.47, S.67, S.131–6, which are possibly associated with F) is not the only assemblage to show heating processes; the broken end of L.15 also shows melting (though not fused additions), and melted droplets are seen on the terminal of torc fragment E.1b. A group of plated coins from the wooded area of the site also seem to have been affected by heat, with metal droplets, perhaps from the plating or underlying metal, visible on their surface (see **Fig. 15.6**).

These fusions most likely result from some kind of deliberate activity rather than accidental heating, such as a fire, because of the unusual splattering of molten metal and fused cut fragments, and the lack of other general fire damage in the hoards. The compositions of these partly fused composite metal fragments and wires vary from high-gold to copper-rich alloys, with the gold alloys forming the main fusing component because of their lower melting point. In the case of F.40 the localised fusing-together of several small cut pieces of wire of different compositions points towards a desire to consolidate these small fragments into a single larger piece. Other examples appear to be fusing of fragments with no obvious connection, such as scraps of twisted wire onto a sheet-metal terminal (F.42).

Linking

There are several composite bundles of artefacts. These can include quite a mixture of objects in terms of their colour, and neck-ring and terminal types. Over 20 of these bundles are present in Hoard F (F.1–F.28). No two bundles are the same, perhaps implying they were collected by different

Figure 20.26 F.42: wires from a multi-strand torc or bracelet fused onto the face of a tubular torc terminal fragment

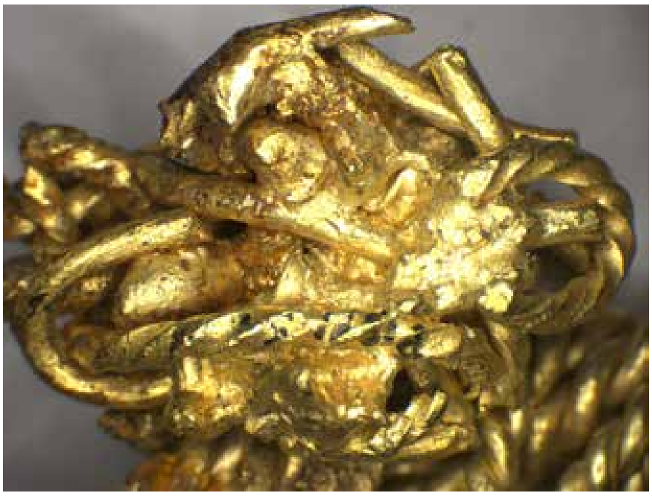


Figure 20.27 Fused mass on one end of cut multi-strand neck-ring fragment F.34, incorporating other types of wire

individuals or groups, or for a variety of purposes. Some artefacts were simply looped together, for example to create a chain of small rings (**Fig. 20.28**). In cases of bundles including torcs, as with the example shown in **Figure 20.29**, the terminal loops (or looped neck-ring sections) of broken torcs or bracelets were sometimes threaded onto a ring. Other groups were interlinked in more complicated ways, such as the six torc fragments that make up F.4a–f.

Whilst some of these composite groups are made up of similar objects (such as small rings, F.25–F.27) or possibly fragments of the same broken torc (F.11a–b, F.16a–b), most seem to emphasise variety. Note the range of alloys of varying colours in **Figure 20.29**: from deep gold to silver, and even including copper alloy fragments. The selection of fragments with a wide range of colours is seen in the majority of these bundles, and was surely intentional. There is also often variation in the types of objects represented in a single bundle. For example, group F.5a–g (**Fig. 20.30**) is a combination of a small silvery-gold-coloured ring formed from a wrought rectangular-section bar (F.5b), a large cut section of thick gold multi-strand torc neck-ring (F.5c), a large section of a multi-strand gold wire torc which has been folded into a tight loop (F.5d), a single length of tightly twisted square-section gold wire curled into a ring (F.5e), a piece of a simple, thin, silver-coloured pair of plied wires, likely from a torc or bracelet (F.5f), and part of a narrow tubular torc kinked twice where it has been folded over (F.5g). All of these are looped onto a second (silvery-coloured) small ring (F.5a), also formed from a wrought bar with rectangular cross-section. Even in groups where similar objects or fragments are brought together, they often come from different objects. For example, bundles F.1a–e and F.2a–i each include two very similar tubular torc terminals. But on close inspection these paired terminals are not identical, suggesting that they came from different torcs. The possible functions of these varied assemblages are discussed below.

In some instances, the collection or interlinking process was itself destructive, with, for example, rough perforations

Figure 20.28 Linked assemblage F.18e–h, j–l (drawing by Craig Williams)

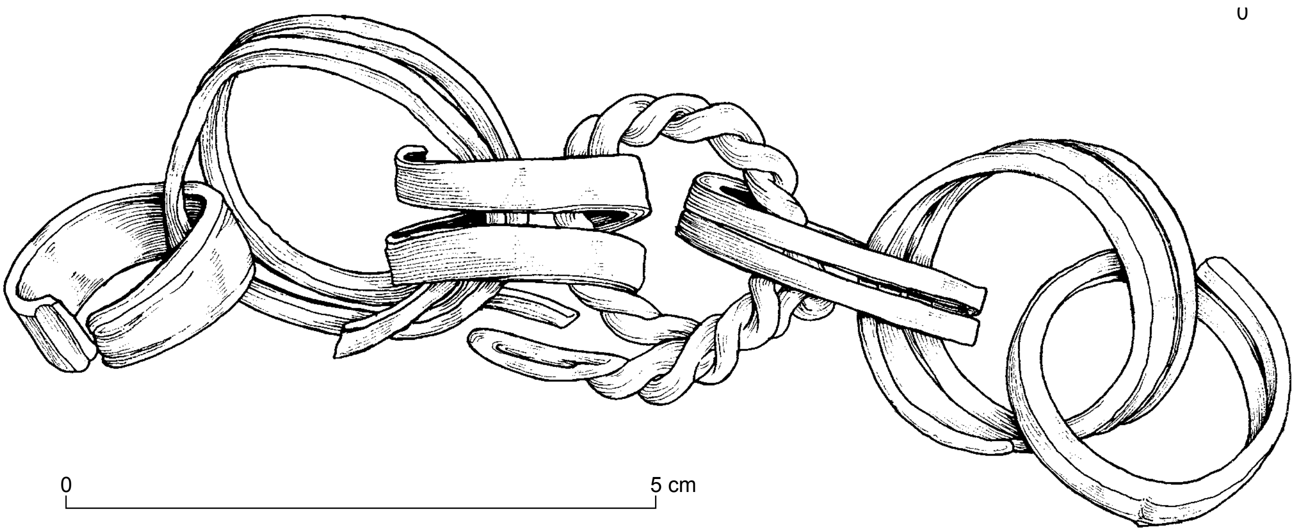


Figure 20.29 Bundle F.3a–i: An interlinked group of torc fragments and rings

Figure 20.30 Bundle F.5a–g: An interlinked group of torc fragments and rings

Figure 20.31 Bundle F.6a–g: An interlinked group of torc fragments and rings

made in tubular torc fragments to attach them to rings (**Fig. 20.31**). Tubular torc fragments were also flattened and folded (as on F.19). In Hoard F, a group of coins (nos 174–8) were deposited contained within a cut section of tubular torc (F.53), folded to create a sealed 'package'.

Hoard E (**Fig. 20.32**) could also be viewed as another form of bundle. A torc fragment (E.1b) and bracelet (E.1c) were both looped together, and the torc fragment was passed through the eyes of the terminals of the 'Great Torc' (E.1a), while a coin (no. 169) was found inside one of its terminals.

In addition, some 'individual' artefacts could also be viewed as bundles, especially those repaired using parts of other objects. The most obvious example is the 'Grotesque Torc', L.19, with a piece of gold sheet (possibly a fragment of tubular torc) used to repair the back of the neck-ring and a broken multi-strand torc or bracelet employed as a 'clasp' to hold the terminals together. In both instances little attempt was made to modify these additional components beyond what was necessary to execute the repair. They therefore remained recognisable artefacts, each with their own histories and biographies. By combining these objects with the torc, their biographies also became intertwined.

Torc biographies

We now turn to the question of how analysis of use and damage can tell us about the lives of torcs before they were buried. As we have seen, many of the torcs (especially multi-strand examples) were heavily worn and must have had long lives before they were collected and deposited in the Snettisham hoards. Few, if any, of the artefacts examined were new, meaning that they were not made especially for deposition and that torcs must have formed an important part of daily and/or ceremonial life. If not an everyday sight, they must have been familiar objects to people living in Norfolk in the 3rd, 2nd and early to mid-1st centuries BC. Examples such as L.19 and L.20 were extensively repaired and could easily have been well over a hundred years old when they were deposited (Ch. 21). This not only underlines the potential social significance of the artefacts but possibly also the value placed on the skill of their manufacture. The fact that such objects had long lives, perhaps regularly being passed down as heirlooms, is perhaps unsurprising given that many were made of gold/silver alloy, a material not extensively used in Britain since the end of the Bronze Age (La Niece *et al.* 2018) and which must have been relatively scarce, at least when torcs were first made in Iron Age Britain, probably sometime in the 3rd or 4th century BC (Chs 21, 22).

Based on this evidence, a number of different scenarios present themselves as the potential biography or itinerary for a torc (Kopytoff 1986; Gosden and Marshall 1999; Joy 2009a; Joyce and Gillespie 2015). The simplest possible narrative is that a torc was commissioned and made for a single person; they wore it intensively, possibly daily and certainly regularly. Torcs could have been given as gifts, to mark life stages and transitions, or in other specific systems of gift exchange (cf. Sharples 2010, 92–5). Through the repeated performance of wearing a torc it became a part of that person: torc and person combined in negotiations of status and identity. Based on the extensive wear on some of the torcs, it is likely that their lives extended beyond a single human lifespan. Perhaps some were therefore passed down to the next generation as a form of heirloom (Lillios 1999). Others may have been exchanged, building histories as they moved between people and places (Gosden and Marshall 1999).

It is difficult to establish whether extensive wear is the result of intensive usage over a relatively short period or less regular usage over an extended period, perhaps decades or even centuries. It is probable that examples from Snettisham represent both extremes and various points in between. Certainly, as evidenced by the way some torcs were decorated (Ch. 21) and through radiocarbon dating of organic components (see **Table 5.2**), some of the torcs were quite old when deposited. Radiocarbon dates were acquired for two torcs as part of the Oxford University 'Technologies of Enchantment' project (Garrow *et al.* 2009). The charcoal core inside fragment F.168 (roundwood less than 10 years old) gave a date of 370–120 cal BC at 95% probability, and 350–170 cal BC at 68% probability. This object was part of Hoard F, which also included Gallo-Belgic coins dating to the mid-1st century BC. This suggests a probable age of at least a hundred years for the torc fragment at the time of burial. Two samples of lime wood fibre string (less than five years old) bound around the back of torc L.6 as a repair to the neck-ring were also tested. One gave an unexpectedly early date of 780–510 cal BC (at 95% probability), most likely an error (Garrow *et al.* 2009, 95), while the other produced a date closely in line with the Hoard F fragment: 360–110 cal BC at 95% probability and 350–170 cal BC at 68% probability. Whilst an early date for the deposition of Hoard L cannot be ruled out, the close stylistic similarities between Hoard L and Hoard F support the likelihood they were deposited within a fairly narrow timeframe. This suggests that torc L.6 was probably of considerable antiquity when it was buried, and the same is probably true of some of the other very heavily worn and repaired torcs from Hoard L (L.19 and L.20 in particular). It is interesting that these demonstrably old and damaged objects were at the bases of their respective pits (L.19–L.21 were at the bottom of the main Hoard L pit, and L.6 was at the base of the upper deposit). These pieces (likely heirlooms, and in at least one case broken to the point of being unwearable), were placed into the ground first, before other (likely newer and certainly less worn) torcs were placed on top. The implications of the placement of torcs of different ages within the hoards are discussed further in Chapter 23.

A distinction must be drawn between the generally high levels of wear observed on multi-strand torcs versus the relatively light wear seen on tubular torcs. Whether this implies a short use-life for tubular torcs or low intensity usage over a longer period is difficult to determine. If the latter is the case, when not in use, the tubular torcs must have been carefully stored. Given the considerable evidence for the damage, both deliberate and accidental, of multi-strand torcs outlined above, it is perhaps likely that the tubular torcs were relatively new and therefore little-used when buried, especially when compared to the multi-strand torcs. This has implications in terms of the possible dating of tubular and multi-strand torcs. Depending on when the hoards were deposited, which is thought to be most likely sometime in the 2nd century BC through to *c.* 60 BC, it implies that tubular torcs could be a product of the 2nd and 1st centuries BC, whereas stylistic and radiocarbon dating demonstrates that multi-strand torcs date back at least to the 3rd century BC.

Figure 20.32 A reconstruction of the Great Torc assemblage (objects E.1a–c) as found

The broad-bodied tubular torcs in particular were made from very thin sheet gold and would have been damaged very easily. Their use was therefore most probably ceremonial, or at least restricted to very particular individuals or occasions. It is possible that some of the larger, more ostentatious multi-strand torcs were also reserved for ceremonial use, but this would have to have taken place over a very long period of time to achieve the extensive wear that has been observed. In this instance they could have been worn as expressions of status (or by holders of a particular office or role) but, given the archaeological record of Norfolk at the time that they were made and used, such a position is possibly more likely to have been acquired through actions and experience rather than through birth-right (cf. Hill 2006). Rather than sharing intertwined life trajectories with specific individuals, ceremonial torcs may have spent much of their lives unused. They perhaps built biographies through the performances and events at which they were worn. Joy (2010) suggested that this may also have been how some Iron Age mirrors were used: they remained covered and stored away for much of their lives.

Whatever their individual life trajectories, all of these artefacts were collected together and incorporated into special deposits at Snettisham. It is uncertain what proportion of the torcs in general circulation ended their Iron Age lives in this way, but other evidence suggests that many were probably recycled and made into something else. For example, both at Snettisham and elsewhere it is clear that a number of different processes were employed to break torcs up, including the use of double-bladed tools (such as shears) and chisels to cut wires (see above, and Gazetteer in Ch. 22). It is quite hard to determine exactly how long before deposition these destructive processes took place. But, given specialist tools were often employed, it is likely there was some degree of planning involved: it was not a spontaneous act. This raises the possibility that many more torcs were in circulation and that only a small proportion made their way into the archaeological record. The presence of many bits of torcs and/or bracelets which cannot be re-formed into a complete artefact also invites the question 'Where is the rest?' (cf. Chapman, J. 2000). Was a part of the artefact kept for special deposition and the remainder recycled, or were they buried in as-yet undiscovered places (cf. Garrow and Gosden 2012, 172–3)?

As noted by Garrow and Gosden (2012, 191, see also Chapman, J. 2000, 45–6), fragmentation of artefacts can

take two forms: breaking up individual objects and separating items designed to be a part of a set. In the case of the Snettisham hoards, it is difficult to be certain if sets of artefacts were also broken up. For example, if a particular torc was intended to be worn with a specific bracelet or armlet. Nevertheless, as is demonstrated in Hoard E, where a torc and a bracelet with very similar decoration (see Ch. 21) and probably made as a set were linked together in the hoard, some sets were maintained. This does not necessarily mean that the life trajectories of these two artefacts followed the same path. They could have been worn by different people or reserved for different occasions, but certainly in deposition an attempt was made to maintain links between the two artefacts or even to reunite them.

Close examination of artefacts from the fragmentary hoards, particularly Hoard F, also shows how artefacts were not only deliberately broken up, but were also linked and fused together to create something new. As Garrow and Gosden observed, 'artefacts have been transformed from wholes to parts and then combined in new ways' (Garrow and Gosden 2012, 140). Groups of artefacts, whether looped, inserted or fused together, form distinct collections of objects within the hoards. Thinking of these as individual 'mini-collections' may help us to account for how the artefacts from large hoards like Hoard F were collected, highlighting a stage in the biographies of hoarded objects which is often neglected: collecting (Joy 2016). As has been suggested for Late Bronze Age hoards from the Carpathian Basin (Dietrich 2014, 479–80; Hansen 1996–8, 19–23), smaller groups of artefacts within a larger whole could have been intended to separate out contributions to the hoard made by individuals or groups. In this way, the grouping of objects may have been entangled with the relationships of the people who made, owned and wore them. That they are deliberately held together implies collection by an individual person for easy storing, holding or transporting, or as a unit of value, so the concept of ownership also comes into play for these bundles and their potential as exchange value. Joy raised some potential motivations behind gathering and depositing these smaller collections within a larger hoard: 'collections such as looped finger rings could have been gathered from various family members, or wider social groups, before being incorporated into the larger collection, explaining the variations in the diameter and form of these rings. In this instance, personal gifts towards the collection were linked together to represent broader social groupings and a collective effort' (Joy 2016, 247). The Snettisham fragmentary hoards are quite heterogeneous, which could imply that the objects were collected by different individuals and groups (Joy 2016, 247). It is difficult to tell exactly how long the collection phase prior to deposition lasted, which raises other questions such as 'Where were they kept?' and 'Were they displayed?'. The implications of these observations on the possible purposes and significance of the Snettisham hoards are further considered in Chapter 23.

It seems likely that some composite objects were not linked purely for deposition but were used or worn in this way. Wearing is unlikely (although not impossible) in the cases of the groups from Hoard F (often looped onto a ring), but highly plausible in other cases. L.19 (if worn at all in its broken state) must have been worn along with its 'clasp' formed from a torc or bracelet fragment, as otherwise the broken neck-ring would have rendered it unusable. Other complete torcs deposited in carefully nested hoards have rings or wires looped through their terminals (for example D.1, G.5 and L.10). Even the Great Torc (E.1a) was not found in the solitary state in which it is now displayed at the British Museum, but as an entanglement of objects more closely resembling the composite group that forms the 'Grotesque' Torc (L.19) (compare **Figs 20.15, 20.32**). Bundle H.2 is a particularly interesting case, being formed of two similar but distinct torcs wound around one another to form a single object. Were these additions functional repairs, extra decoration, or a means of keeping scrap together? Alternatively, did they represent an accumulation or layering of their wearers' life stages, relationships, or other kinds of connection?

Fragmentation and accumulation

A variety of explanations have been put forward for the presence of fragmentary object groups such as Hoards B, C and F. In past explanations of the Snettisham deposits, these have generally been interpreted as metalworkers' hoards (Clarke 1954). This potential use is certainly possible, but the patterns of breakage and linkage seem to be of a different nature than one would expect from a collection purely of scrap. For example, why create such elaborate collections of artefacts within the hoard? Whilst in a few cases, as noted above, these groups could have been worn as ornaments in their own right, most could not.

It is possible that the complex interlinked groups present in Hoards B and F represent scrap gathered together, but these mixed sets of artefacts are difficult to explain from a modern understanding of metal recycling in which different alloys would be first separated before melting. Within the bundles there is generally no selection by alloy colour (composition): gold-rich, silver-rich and copper alloy pieces are incorporated together. Whilst the sheet gold objects tend to be high in gold content, the precious metal rings and multi-strand torcs are varied ternary alloys of gold, silver and copper (Ch. 17). Indeed, in some cases such as bundle F.3a–i, it is almost as if the aim was to collect together examples of as many different colours as were produced. Machling and Williamson (2020) have suggested that some of these composite groups could represent a kind of 'pattern book' for torc makers, although this explanation works better for some bundles (such as F.3 and F.7) than others.

Whilst an intended use as batches of scrap for melting and recycling into other objects cannot be ruled out, it would have been extremely hard to control alloy composition when mixing objects in this way. Refining gold would have been a very time consuming, specialised and technical process (Ramage and Craddock 2000) that surely would have been largely avoided, if possible, by simply pre-sorting the metals. Such groups could in theory, however, have been used to make new rings, torcs or bracelets. Indeed, Northover (Ch. 18) has argued that the wrought large and small rings found at Snettisham were probably made from mixed recycled torc components. In this scenario, the careful grouping of such disparate elements into discrete bundles raises the question

of whether the identities and biographies of the objects chosen to be recycled together were more important than their metal content.

Joy (2016, 247) argued that the deposition of the Snettisham torc hoards coincided with the period when coinage was first minted in Norfolk (Ch. 23; Chadburn 2006). Whilst the metal content of coinage was relatively carefully controlled and in many cases seems to have used standard alloys based on diluted bullion (Northover 1992; Creighton 2000; Farley 2012), there does seem to have been some addition of recycled metal. For example, Northover (1992) highlights the similar compositions of early gold coinage and torcs in Late Iron Age Gaul, and Northover (*ibid.*, 247) and Ponting (Appendix 4) have argued that high-tin copper alloy Kentish potin coinage may have been melted down and incorporated into some of the early insular precious metal issues. Mixed groups of objects (such as the composite interlinked groups) would probably only have been readily recyclable into coinage as a small component of a much larger batch of metal, but it is likely that at least in some instances high-gold torcs or refined gold and silver from other objects could have been re-used to make coins.

If indeed many torcs (or parts of torcs) were recycled into coinage or other objects, this raises the question of why so many were buried at Snettisham, thus removing their metal content from circulation. It is likely that to some degree there were social rules regulating such recycling behaviours, and it may have been considered necessary to employ a certain proportion of such objects in votive practices. If and when torcs were broken up to make coins, perhaps a fragment was kept, looped onto a ring and held aside for appropriate deposition. Offering a part of an object to represent a whole, or *pars pro toto*, is a practice which was followed at Greek sanctuaries. It has also been offered as an explanation for why some Bronze Age hoards contain fragments (Hansen 2013, 180) and is widely practised in cremation burial on the continent at this time. In Britain, a small fragment of gold foil, likely from a tubular torc, was also recovered from a cremation burial at Westhampnett, West Sussex (Fitzpatrick 1997, 97–9).

Alternatively, if as is suggested above, some of the bundles operated as a kind of 'pattern book' (Machling and Williamson 2020), it provides a different perspective on so-called 'scrap' hoards. Interpreted from this viewpoint, some of these bundles may have served important roles in the selection by consumers of what they wanted metalworkers to make. Their incorporation into hoards brought about a ceremonial closure to this process, perhaps signalling an end to the manufacture and consumption of torcs.

In other cases, particularly those of complete torcs, it is possible that these were potent or deeply personal objects in their own right, and that it may not have been considered appropriate to melt down these pieces. The value of coinage lies explicitly in its standardisation and multiplicity – the possibility of creating, distributing or keeping many similar, small, portable objects. Torcs are different. Every torc represented at Snettisham is unique. In some cases, there may have been a pressure or preference not to dissolve recognisable (and perhaps powerful) objects with individual histories into the more anonymous and standardised world of coinage, where it is essential that batches of similar issues hold like-for-like value (regardless of the previous forms of the metal).

Fragmentation could also be considered a form of decommissioning or symbolic 'killing' of the artefact in preparation for deposition, as is sometimes argued for the deliberate damage inflicted on weaponry in watery contexts and burials. The practice of deliberate damage to martial metalwork is seen in 1st-century BC grave goods from Britain including the warrior burial from Kelvedon, Essex (Sealey 2007), where the sword was removed from its scabbard and bent prior to burial, and an iron spearhead was also bent and its shaft possibly snapped.

J. Chapman's (2000; see also Chapman and Gaydarska 2007) well-known theories on fragmentation and accumulation are useful for thinking through the patterns of wear and re-forming observed at Snettisham (although it is noted that there are some problems with this theory (Fowler 2004; Jones 2005; Gamble 2007; Brittain and Harris 2010) and that it relates to a particular case study from Balkan prehistory). Chapman stated that, '…the notion that fragments of objects transmit not only the symbolism of their complete, once-intact form but also the enchained, or fractal, connotations of past makers and owners would account for a wide variety of fragmentation behaviour' (Chapman, J. 2000, 39). In other words, fragments were not just intended to stand for whole objects (*pars pro toto*); they enchained relationships between people and objects.

Returning to Snettisham, it is clear that in many instances, fragmentation of torcs was deliberate. Perhaps a part was kept for deposition, representative of the whole, but allowing the bulk of the object to be recycled. Their inclusion in the hoards might have embodied or made present particular individuals/groups and even the relationships between them. Following this line of thinking, other scenarios also present themselves. For example, as Gosden has suggested, bits of torc '…could have operated in small units like coins, and in some cases, like the highly decorated tubular torc fragment, they carried complex decorations' (Gosden 2013, 49). These bits of torc may have acted as 'extended' (cf. Gell 1998) versions of the whole object, only multiplied and transformed into smaller, more transferable units. Another more prosaic explanation could be that some forms of breakage, for example the division of thick wires into roughly equal sizes, was a part of the recycling process – a standard unit perhaps used in weighing out specific quantities of different alloys to make a batch of metal with a certain composition. The two explanations are of course not mutually exclusive as memories of previous artefacts could have been maintained in new artefact forms (Ch. 23).

J. Chapman's (2000) original work was focused on the Balkans, where he contended Neolithic people selected fragmentary objects for use in exchange and as a means of linking people, objects and places through what he called enchainment. A further aspect to his work, which has received less attention, is the related category of accumulation, whereby objects were gathered into sets which generate different types of relations. At first sight, this model seems to fit well with the objects from the Snettisham

Figure 20.33 Torcs B/C.9, B/C.10, B/C.11, G.14, H.11 and bracelet B/C.12

hoards. There is abundant evidence for the deliberate fragmentation of objects as well as accumulation through the creation of sets or collections of artefacts as hoards, and also within hoards. Whilst Chapman's is a highly plausible explanation of material from the Balkans, following Brittain and Harris (2010), we are alert to the issues related to imprinting it onto Iron Age Norfolk. Rather, the fragmentation and accumulation of artefacts is viewed as transformational, whereby processes associated with recycling (such as breaking up and re-forming objects) were cited through the collection and manipulation of artefacts prior to their deposition.

Biography case study: twist direction, makers and selective treatment in deposition

Beyond interlinked groups, sealed hoard contexts or 'matched' sets such as E.1a and E.1c, it is generally hard to distinguish apparent groups or sets of objects at Snettisham, and any implications this may have for their makers, users and treatment in deposition. One case where this may be possible is an unusual group of simple torcs incorporating Z-twist in their manufacture.

Both S-twist and Z-twist directions are used in the Snettisham multi-strand torcs, though S-twist overwhelmingly predominates. Z-twist is used almost exclusively in complex multi-stage neck-rings where it is combined with S-twist to produced particular effects (see Ch. 13). Eight small objects/fragments in Hoard F (F.3e, F.3h-i, F.4d, F.8b, F.11a-b, F.44, F.141, F.142) have a primary Z-twist construction, i.e. represent simple Stage II objects with wires plied directly together Z-twist. Only two of these sets (F.4d, F.3.h-i) seem likely to represent the existence of Stage II Z-twist objects. The others are more likely re-twisted, unfinished or fragments from more complex torcs. There are only two other objects in the BM collection with a primary Z-twist construction: G.14 and K.5. Each of these is of (2PZ) construction, i.e. two wires plied directly together Z-twist.

Among the NCM material, Hoard 'B/C' (the mixed material deriving from Hoards B and C) has four complete torcs/bracelets with the same (2PZ) construction (B/C.9, B/C.10, B/C.11, B/C.12; **Fig. 20.33**) and fragments representing at least another five such objects (B/C.5, B/C.14–15, B/C.24, B/C.35, and B/C.36). There are also two fragments of neck-ring with (3PZ) construction (B/C.42–3), a design not shared by any other objects from the site. Together, this suggests a minimum number of ten objects from Hoard B/C objects with a simple Stage II Z-twist construction. These include more-or-less the only complete torcs/bracelets from Hoards B and C (the only other contenders being the two now-fragmentary torcs represented by B/C.47–53).

This is a significantly higher proportion of simple Z-twist torcs and bracelets in Hoards B and/or C than in other assemblages (around 16% of multi-strand objects/fragments with an identifiable construction across assemblages B, C and B/C, compared to just 2% in Hoard F). The complete Hoard B/C pieces (three small torcs – B/C.9, B/C.10, B/C.11, and a bracelet – B/C.12), are distinctive enough to appear to represent a group or set. All are very simple

copper alloy pieces, made from either two wires, giving open loop terminals (B/C.9), or one wire doubled-back on itself to give one closed and one open loop (B/C.10-12). This is unusual across the site, where closed loops (soldered or hammered to give the effect of a single continuous wire) are the norm. Their alloys are similar in terms of bulk composition; impurity patterns suggest that the smaller objects, B/C.10–12, may have had a similar metal source, with comparable levels of Co, Ni and Ag, whilst B/C.9 is higher in both Co and Ag, and falls into Northover's 'Group 1' (Co>Ni and Sb<0.10%).

K.5 is very different (in a gold/silver alloy and with ring terminals), so does not seem to belong with the B/C group. Torc G.14, whilst made from wire with a finer gauge, is otherwise very similar to the B/C examples in terms of both external diameter and construction, and could be suggested as part of the same group (**Fig. 20.33**).

The small size of these simple Z-twist torcs is notable. Torc B/C.9 is small, but has had its terminals pulled open quite wide. By internal diameter, torcs B/C.10 and B.C/11, with G.14, are three of the five smallest torcs from the site. The others are H.9, a coiled torc with its terminals overlapping, reducing its diameter significantly, and H.11 (**Fig. 20.33**). The latter is made S-twist, but is otherwise virtually identical to B/C.9 (made from two wires to give open loop terminals, and having a loose neck-ring twist). Notably, Torcs H.11 and G.14 were both treated in a similar way, being placed at the base of the lower pits of nested hoard deposits (see Ch. 23). The B/C.9-12 group also seem to have received special treatment, being perhaps the only torcs and bracelets from Hoards B and C that were not broken up before deposition.

The small size, simple design and unusual Z-twist construction of bracelet B/C.12 and torcs B/C.9-11 and G.14 perhaps suggest the work of a single person. To the casual observer, there is little difference in the overall effect created by S and Z-twist, but the use of Z-direction twist on these five objects is unlikely to be accidental given its overall rarity across the assemblage and the close visual and technological similarity between the pieces. It is worth noting that Z-twist is the direction a left-handed maker would naturally tend to twist, while for a metalsmith who usually tended to twist wires in the S-direction, this would be a notable change from that habitual motion. Perhaps this was simple personal preference, or maybe Z-twist was considered more appropriate for some individuals, roles or circumstances? H.11, with its similar size and simple construction, may be a related or similar object, despite its opposing twist direction.

It is likely that decisions about collection, grouping, deposition and treatment such as fragmentation were often influenced by factors from the biography of a torc, such as its maker(s) and/or owner/wearer(s). Usually, these elements remain invisible to us, but it seems that in this case a group of torcs, potentially the work of a single maker or workshop, can be identified by their appearance and twist direction. These objects were disproportionately kept whole (rather than being fragmented), and chosen for deposition either in Hoard B/C or at the base of the lower pits of Hoards G and H. They may well have been in some way associated with particular individuals, roles or families/communities.

Summary

The very idea of a straightforward, individual 'object biography' from raw material to finished object to heavily worn heirloom is challenged by the assemblages from Snettisham. While many torcs certainly passed through these stages, some appear unfinished, such as S.17 which retains the casting sprues on its terminals. Others have been repaired, damaged, fragmented and (re)combined in a wide variety of ways. The precise meanings behind these processes are now lost, but it seems certain that they related in some way to referencing, transforming and reconfiguring the complex interrelationships between these objects and their owners, wearers and makers. Further implications of the relationships between fragmentary hoards, hoards of complete or near-complete objects, and other potential groupings among the Snettisham material are considered in Chapter 23.

Chapter 21
Decoration of the Snettisham Torcs and Other Objects

Jody Joy

Excluding coins, roughly 4% of the metalwork finds from Snettisham (over 40 objects) are decorated. This may seem quite a small proportion but, taken as a whole, this represents one of the greatest concentrations of so-called Celtic art from Britain. The decorated finds are summarised in **Table 21.1**. In this chapter the decoration is examined in detail. First the ornament on different artefacts is discussed, before an account is presented of the implications for our understanding of the Snettisham deposits and Celtic art in Britain. A final section questions what the art on torcs may have done. Although features such as the filigree found on two of the large tubular torcs in Hoard A are also considered decorative (see Ch. 17), here analysis is focused on raised, inscribed and punched ornament.

The following account of the decoration, which forms the first section, is broken down by artefact type, beginning with art on torcs.

Decoration on torcs

Most of the decorated objects from Snettisham are torcs, or fragments which might have belonged to either torcs or bracelets/armlets (**Table 21.1**; **Fig. 21.1**). This is also reflected in the dominance of decorated objects which are made of gold/silver alloys (**Fig. 21.2**). Owing to the large number of decorated artefacts, and as an attempt to create some order for the discussion, the art is broadly categorised following Garrow's (2008) distinction between 'swirly' and 'non-swirly', with the terminology altered slightly here to 'curvilinear' and 'non-curvilinear'. Unsurprisingly, objects with curvilinear decoration are considered to be 'artefacts adorned with curvilinear motifs' (Garrow 2008, 19). Other forms of decoration are included in the non-curvilinear group. Stead's (1985a; 1985b; 1996) art 'styles' or 'stages' (he uses both terms in various publications), which build on Jacobsthal's (1969 [1944]) and de Navarro's (1952) categorisations, have been critical to our understanding of Celtic art in Britain. They are drawn upon extensively here, forming the basis of discussion. Stead characterised his styles as 'stages', a sequence of styles replacing each other in a chronological order, albeit with some overlaps. As Stead (2009) himself has recognised, the sequential nature of these styles has been undermined by recent discoveries showing that there is actually considerable overlap, particularly during the 3rd century BC. In this chapter, styles are primarily used as a means of categorisation. Following Garrow and Gosden (2012), Celtic art styles are seen as overlapping and cumulative, not sequential and successive. Close consideration will also be given to the use of different styles on the same object, in particular the deployment of different styles to make potential connections and relations to the past, present and future.

Non-curvilinear

Discussion of non-curvilinear decoration in this section is restricted to torcs decorated exclusively with non-curvilinear patterns. Torcs decorated with a combination of curvilinear and non-curvilinear motifs are discussed in the section on mixtures of motifs.

Only a small number of torcs are decorated exclusively with geometric or other non-curvilinear designs, and the

Cat. no.	Object type	Material	Curvilinear decoration	Non-curvilinear decoration	Stead's 'Style'	Notes
A.1	torc (tubular)	gold/silver alloy	Y	Y	V	Mixes raised curvilinear and non-curvilin-ear (including punch-marks)
A.2	torc (tubular)	gold/silver alloy	-	Y	-	Punch-marks
A.3	torc (tubular)	gold/silver alloy	-	Y	-	Punch-marks
E.1a	torc (multi-strand)	gold/silver alloy	Y	-	V	Raised curvilinear
E.1c	bracelet	gold/silver alloy	Y	-	V	Raised curvilinear
F.2c	?torc (?tubular)	gold/silver alloy	-	Y	-	Non-curvilinear
F.6b	torc (tubular)	gold/silver alloy	Y	-	V	Raised curvilinear
F.31a	torc (tubular)	gold/silver alloy	Y	Y	II, V	Mixes non-curvilinear with a variety of 'curvilinear' art styles
F.31b	torc (tubular)	gold/silver alloy	-	Y	-	Non-curvilinear
F.32	torc (tubular)	gold/silver alloy	-	Y	-	Non-curvilinear
F.42	torc (tubular)	gold/silver alloy	-	Y	-	Non-curvilinear
F.43	torc (tubular)	gold/silver alloy	Y	-	IV, V	Mixes a variety of 'curvilinear' art styles
F.46	torc (tubular)	gold/silver alloy	Y	Y	V	Mixes raised curvilinear and non-curvilin-ear
F.53	torc (tubular)	gold/silver alloy	-	Y	-	Non-curvilinear
F.54	torc (tubular)	gold/silver alloy	-	Y	-	Non-curvilinear
F.55	torc (tubular)	gold/silver alloy	-	Y	-	Non-curvilinear
F.57	torc (tubular)	gold/silver alloy	Y	-	V	Raised curvilinear
F.72	torc (multi-strand)	gold/silver alloy	Y	-	III	Plastic Style
F.92	torc (multi-strand)	gold/silver alloy	Y	-	V	Inscribed curvilinear
F.106	torc (multi-strand)	gold/silver alloy	Y	-	V	Mixes raised curvilinear (terminal face) and inscribed curvilinear (terminal edges)
F.115	torc (multi-strand)	gold/silver alloy	Y	-	V	Raised curvilinear
F.119–20	torc (multi-strand)	gold/silver alloy	Y	-	V	Raised curvilinear
F.146	torc (multi-strand)	gold/silver alloy	-	Y	-	Non-curvilinear
F.185	torc (multi-strand)	copper alloy	Y	-	V	Raised curvilinear
F.445	helmet	copper alloy	Y	-	V	Raised curvilinear (decorated patches)
H.7	torc (multi-strand)	gold/silver alloy	-	Y	-	Non-curvilinear
K.7	torc (multi-strand)	gold/silver alloy	-	Y	-	Non-curvilinear
L.10a	torc (multi-strand)	gold/silver alloy	Y	-	V	Inscribed curvilinear
L.11	torc (multi-strand)	gold/silver alloy	Y	-	V	Raised curvilinear
L.12	torc (multi-strand)	gold/silver alloy	Y	-	V	Raised curvilinear
L.13	torc (multi-strand)	gold/silver alloy	Y	-	V	Inscribed curvilinear
L.14	torc (multi-strand)	gold/silver alloy	-	Y	-	Non-curvilinear
L.16	torc (multi-strand)	gold/silver alloy	-	Y	-	Non-curvilinear
L.17	torc (multi-strand)	gold/silver alloy	-	Y	-	Non-curvilinear
L.18	torc (multi-strand)	gold/silver alloy	-	Y	-	Non-curvilinear
L.19a	torc (multi-strand)	gold/silver alloy	Y	-	III	Plastic Style
L.20a	torc (multi-strand)	gold/silver alloy	Y	-	V	Inscribed curvilinear
L.21a	torc (multi-strand)	gold/silver alloy	Y	-	V	Raised curvilinear
S.11a	torc (tubular)	gold/silver alloy	-	Y	-	Non-curvilinear
S.13	torc (tubular)	gold/silver alloy	Y	-	?III, ?V	Anthropomorphic
S.48	torc (multi-strand)	gold/silver alloy	Y	-	V	Raised curvilinear
S.19	torc (multi-strand)	gold/silver alloy	Y	-	V	Inscribed curvilinear
S.83	torc/bracelet	copper alloy	Y	-	?III	Zoomorphic
S.253	horn terminal	copper alloy	Y	-	?IV	Zoomorphic
S.254	horn terminal	copper alloy	Y	-	?IV	Zoomorphic

Table 21.1 Decorated objects from Snettisham

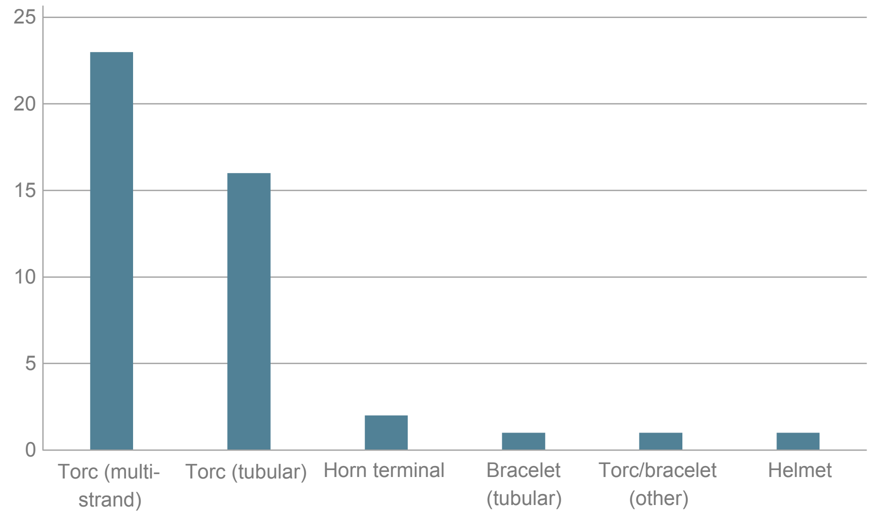


Figure 21.1 Numbers of decorated items by object type (n=44)

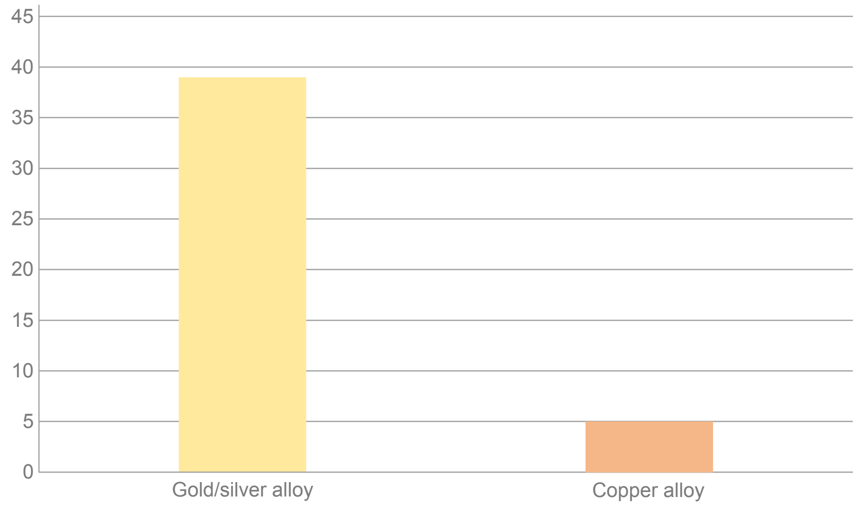


Figure 21.2 Numbers of decorated items by material (n=44)

majority of these are tubular torcs (especially the narrower-bodied neck-rings of Type 4–5 tubular torcs, see Ch. 13). Tubular torcs are also decorated with curvilinear motifs, but these are most often broader-bodied Type 6 torcs, the buffer terminals of Type 1 examples, or the large, flaring terminals of Type 5 torcs (e.g. F.31a, see Ch. 13 for typology). F.54 is a fragment of gold/silver alloy Type 4/5 tubular torc neck-ring, broken at both ends. It is decorated with impressed lines, both angular and spiralled, and a zone of punch-texture/stippling (**Fig. 21.3**). Similarly, F.55 is also a fragment of gold/silver alloy Type 4/5 tubular torc, comprising a short section of neck-ring, broken at both ends. It is decorated with impressed lines, creating a spiral design or mock-twist, with alternating plain and punch-textured zones. The surface of the Type 4–5 tubular torc neck-ring fragment F.53 (**Fig. 21.4**) is elaborately decorated with punched and chased designs. Zones are separated by simple double-grooved lines. One zone is quite simple, with punch-texture/stippling and a line of small, untextured triangles. Another is divided into diamond and triangular-shaped panels within which decorative motifs include concentric circles, crescents and punch-texturing. Terminal F.42 is made of a gold/silver alloy but unlike the examples already mentioned, it is a Type 5 tubular torc fragment with a flat buffer terminal and a lightly tapering neck-ring. The neck-ring has three crimped 'pie-crust' seams and a punch-textured or stippled surface (**Fig. 21.5**). The expanded terminal has a round end-plate with a raised circular 'segmented wreath' motif. F.31b is a short length of narrow Type 1 tubular torc neck-ring (discovered inside Type 5 tubular torc terminal F.31a), with simple decoration consisting of zig-zagging lines of punched dots which divide the surface into lozenge shapes. Similar decoration is also seen on F.32, a Type 4–5 tubular torc neck-ring fragment (**Fig. 21.6**) and the fragment S.11a. S.11a is a gold/silver alloy Type 4 or 5 tubular torc fragment which has been torn at both ends and bent into a tight V-shape. It is decorated with lines of punched dots creating a line of elongated diamond shapes along the surface of the torc (see **Pl. 14.63**).

Small gold alloy sheet fragment F.2c has a raised area of decoration comprising a series of concentric circles, set in a plain field, and may also derive from a tubular torc or torus terminal (**Fig. 21.7**).

As these descriptions indicate, non-curvilinear decoration is largely made up of zones, often bordered by double-grooved lines and chevrons. Zones are triangular, rectangular or diamond-shaped and can be textured by stippling and light punching or left untextured. Areas containing concentric circles and crescents are primarily untextured.

It is of note that non-curvilinear patterns occur only rarely on multi-strand torcs. Here, non-curvilinear designs

are generally very simple. They take various different forms, ranging from zig-zag or 'pie-crust' lines or mouldings (seen on F.146, L.17 and L.18), to lines of inscribed dots (K.7, L.16) or raised dots (such as the line of five knobs on the outside of L.14, which may be the heads of rivets which serve a mechanical function, or the decorative raised dots on H.7).

There are few parallels for non-curvilinear decoration on Iron Age metalwork, which is dominated by curvilinear patterns (cf. Garrow 2008). Some swords and scabbards are decorated with concentric circles, such as the raised concentric circles at the bottom of the scabbard from Bugthorpe, Yorkshire. In addition, harness pieces dating to the 1st century AD are decorated with geometric patterns (Davis and Gwilt 2008). But, geometric shapes and non-curvilinear patterns are more common on pottery and antler and bone artefacts than metalwork, with ring and dot motifs but also triangles and diamond patterns often found on objects like long-handled combs made of antler and bone (Tuohy 1999). It is argued elsewhere (Joy 2011) that two parallel decorative traditions can be identified in the later Iron Age in Britain: curvilinear motifs primarily on metalwork, and non-curvilinear motifs on bone and antler artefacts and pots. Of course, there are notable exceptions, such as the curvilinear decoration found on Glastonbury ware (e.g. Cunliffe 2005, A.22–3) and also pottery from some parts of eastern England (e.g. Cunliffe 2005, A.26, A.28–9) but in the main the identified pattern holds true. The decoration on tubular torcs represents another exception.

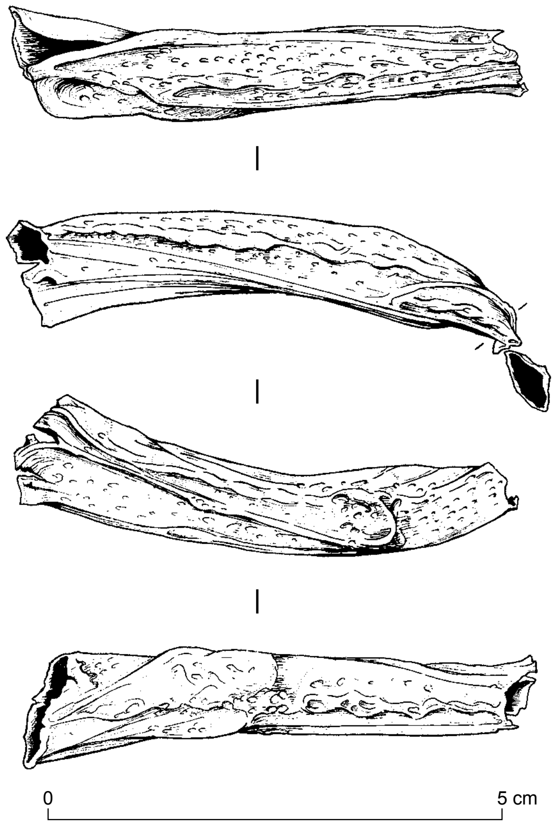


Figure 21.3 Illustration of torc F.54 (drawing by Craig Williams)

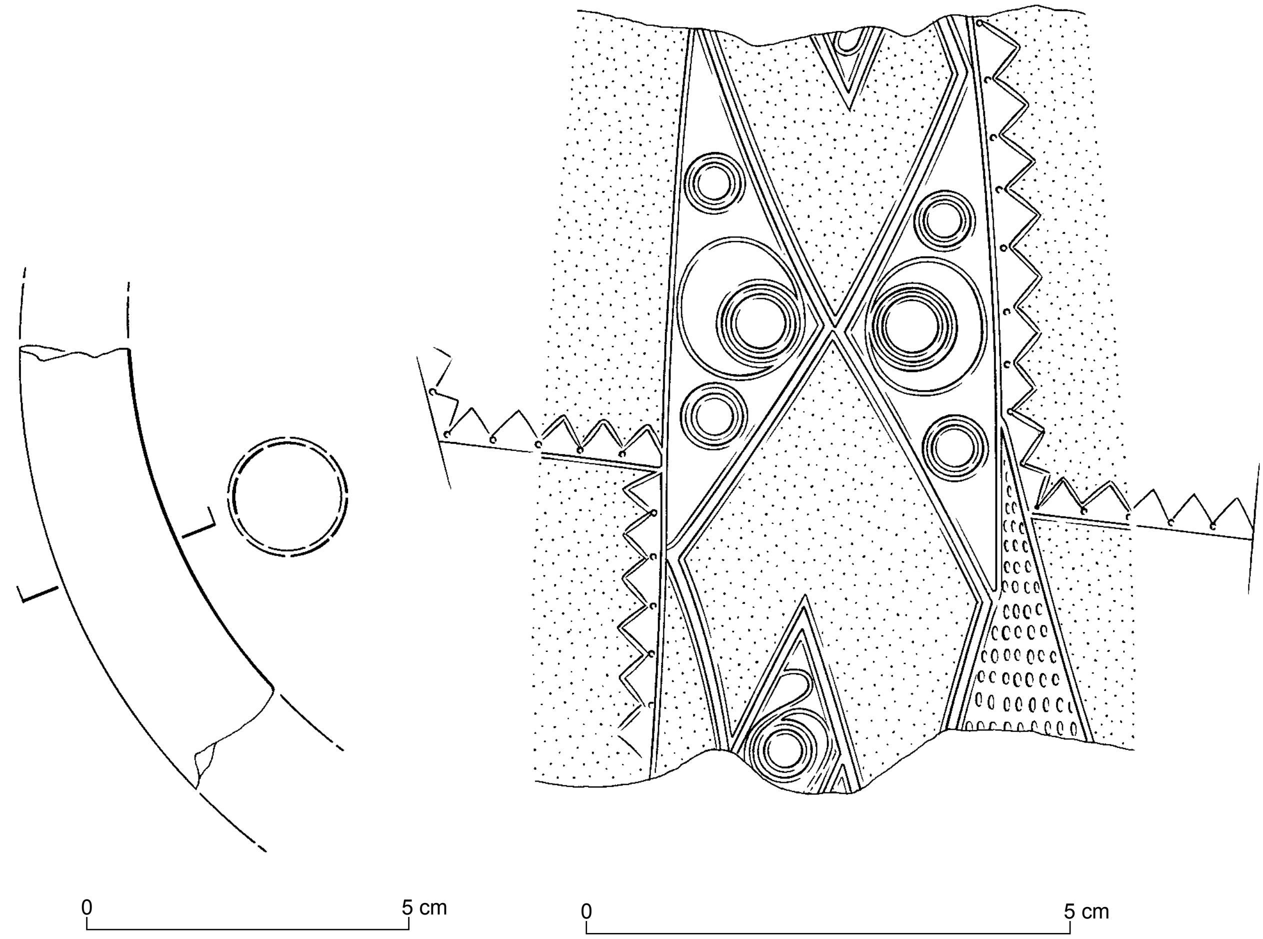


Figure 21.4 Illustration of torc F.53 (drawing by Jim Farrant)

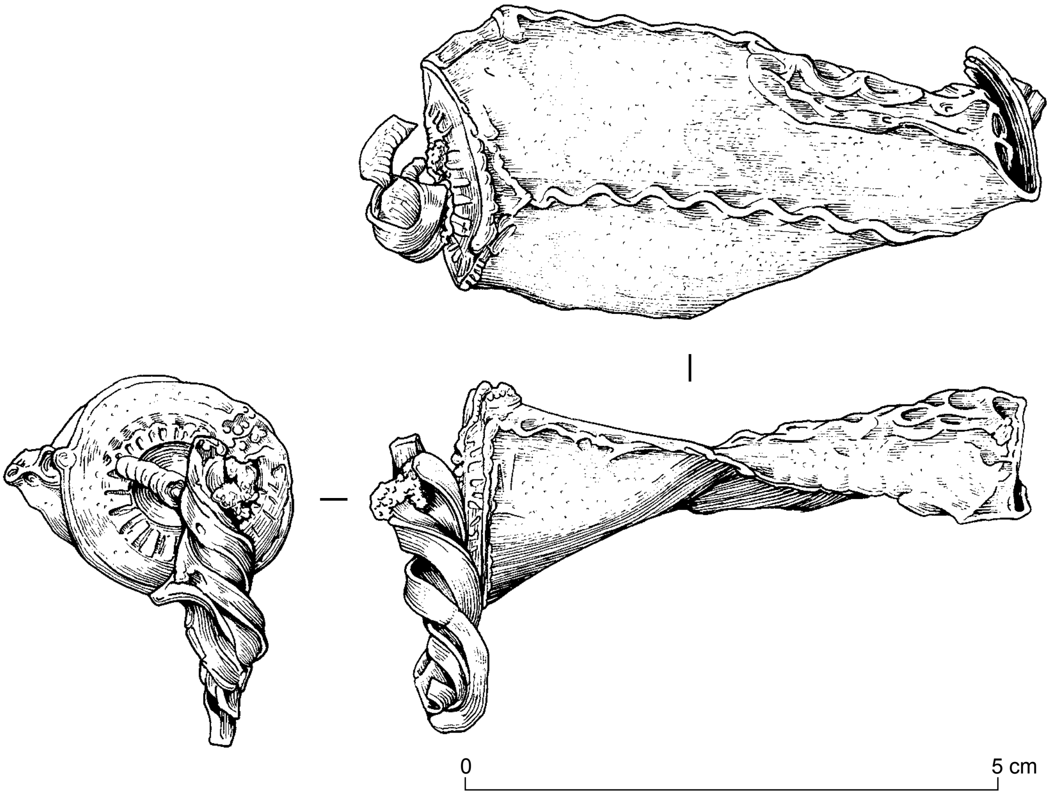


Figure 21.5 Illustration of torc F.42 (drawing by Craig Williams)

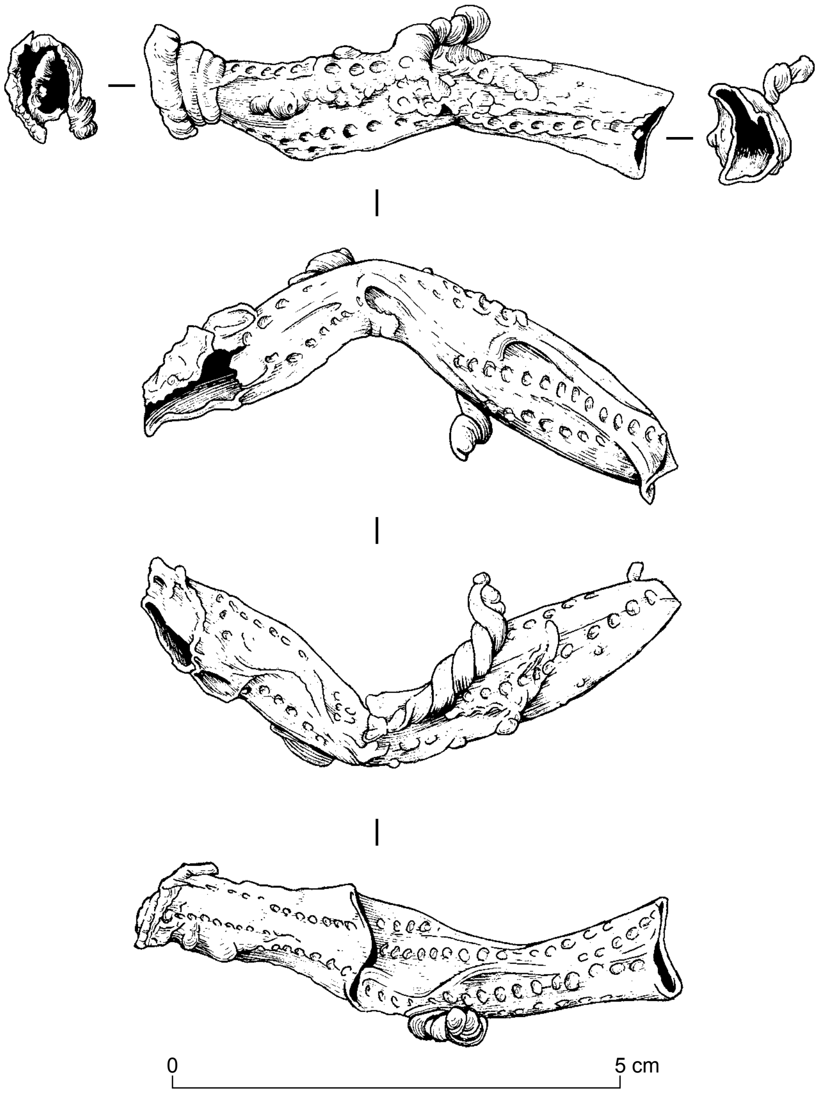


Figure 21.6 Illustration of torc F.32 (drawing by Craig Williams)

Figure 21.7 Detail of fragment F.2c, a piece of gold alloy sheet with concentric circle decoration. There are similar concentric circle motifs on both tubular torcs such as S.13 and the torus terminals of the 'Great Torc', E.1a. It is likely that F.2c ultimately derives from a similar object

Overall, there is less consistency to tubular torc ornament than the decoration on multi-strand torcs. For example, complete Type 6 tubular torc A.1 (**Fig. 21.8**) sports a raised curvilinear design on its rear decorative band, but the decoration also includes non-curvilinear elements, such as punch-marks, a chevron pattern created by inset wires (Ch. 17), and the swastika motifs within the raised domes of the curvilinear pattern. It is easy to read too much into these inconsistencies, but one possibility is that the Snettisham tubular torcs originated from various suppliers, including some on the continent, whereas sources for multi-strand torcs were restricted to a smaller region and therefore they were more consistent in the motifs employed. But, as we will see, there is also variation in terms of the decoration on multi-strand torcs. Another likely explanation is that different decoration rules applied to tubular torcs.

Punch-marks

One particular 'non-curvilinear' feature appears on the neck-rings of some of the tubular torcs from Hoard A: circular punch-marks in various arrangements. The inner curve of the tube of A.1 (**Fig. 21.8**) has three rows of offset circular punch-marks. Each of these is around 3mm in diameter and they are arranged so that the central row has 33 punch-marks whereas the upper and lower rows are each made up of 10. Similarly, on the inside of the tube of torc A.2 (**Fig. 21.9**) there are also punch-marks; in this instance they are around 2.5mm in diameter and are arranged into a row of seven on one tube and 14 punch-marks in a line on the other. Finally, on the inside of the tube of torc A.3 (**Fig. 21.10**) there is a centrally positioned row of 13 groups of four punch-marks, each arranged in a square, and a line of three such groups above and below this main run. Similar punch-marks have been noted on large tubular torcs of the same type from elsewhere. For example, one of the torcs from the hoard found at Frasnes-lez-Buissenal in southern Belgium also has a row of punch-marks each arranged into four dots forming squares, just like torc A.3 (Clarke 1954, 44).

The role of these punch-marks is unclear. They appear on the inside surface of tubes so would not have been visible when the torc was worn. Although there are multiple punch-marks, owing to the consistency of their diameters they were most probably applied at the same time or, less likely, on several occasions using the same tool. This appears to rule out the possibility that punch-marks recorded events in the life of the object. More probably, they were applied at the time of manufacture. It is therefore possible that they represent some form of maker's mark, but this seems unlikely given their number and often complicated arrangement as surely one unique mark would suffice for this purpose. The fact that similar (although varied) sets of markings appear on all known complete tubular torcs of this type, led Hautenauve (2005, 85–6) to suggest that the addition of these marks was part of a widely shared ritual practice. It is notable that the tubular torc from Mailly-le-Camp, France (NE, Aube) (Hautenauve 2005, no. 113, 85–6), in the same area as its punch-marks, is inscribed with a series of symbols, some seemingly constituting personal names and one perhaps related to the tribe of the Nitiobroges. Lejeune (1969, 76) argued that these were the names of dedicants associated with the hoard of which the torc formed part.

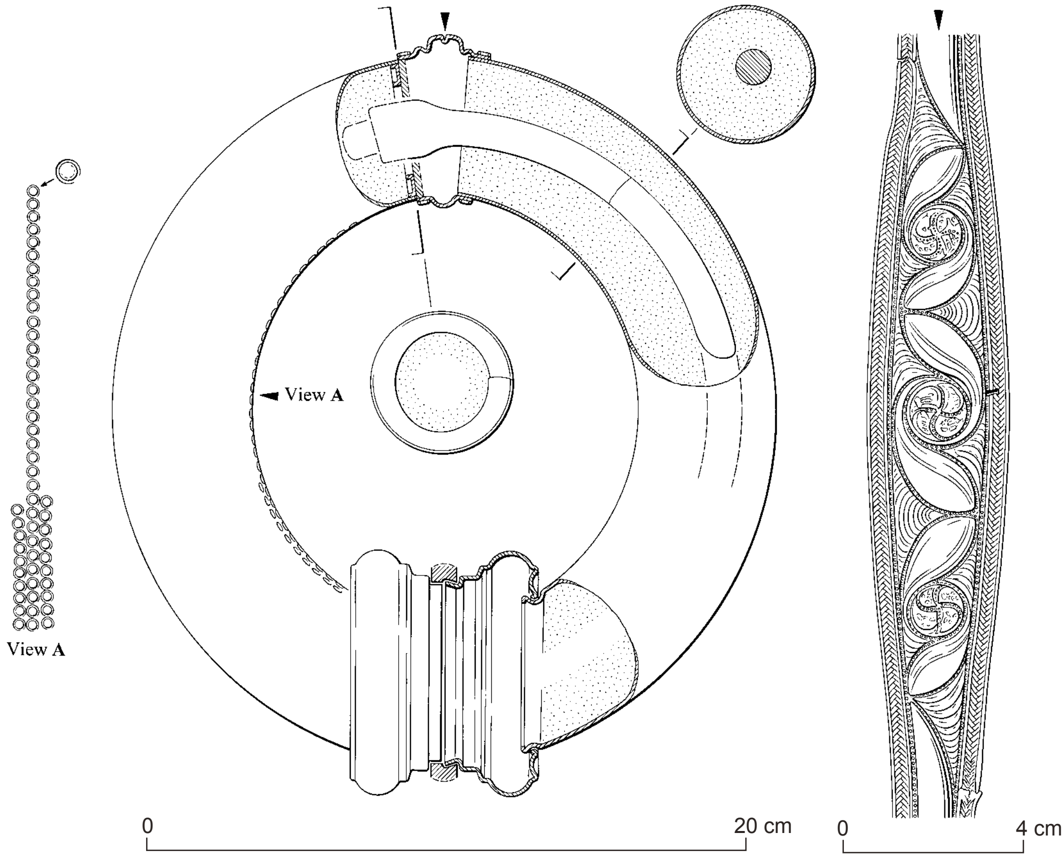


Figure 21.8 Illustration of torc A.1 (drawing by Jim Farrant)

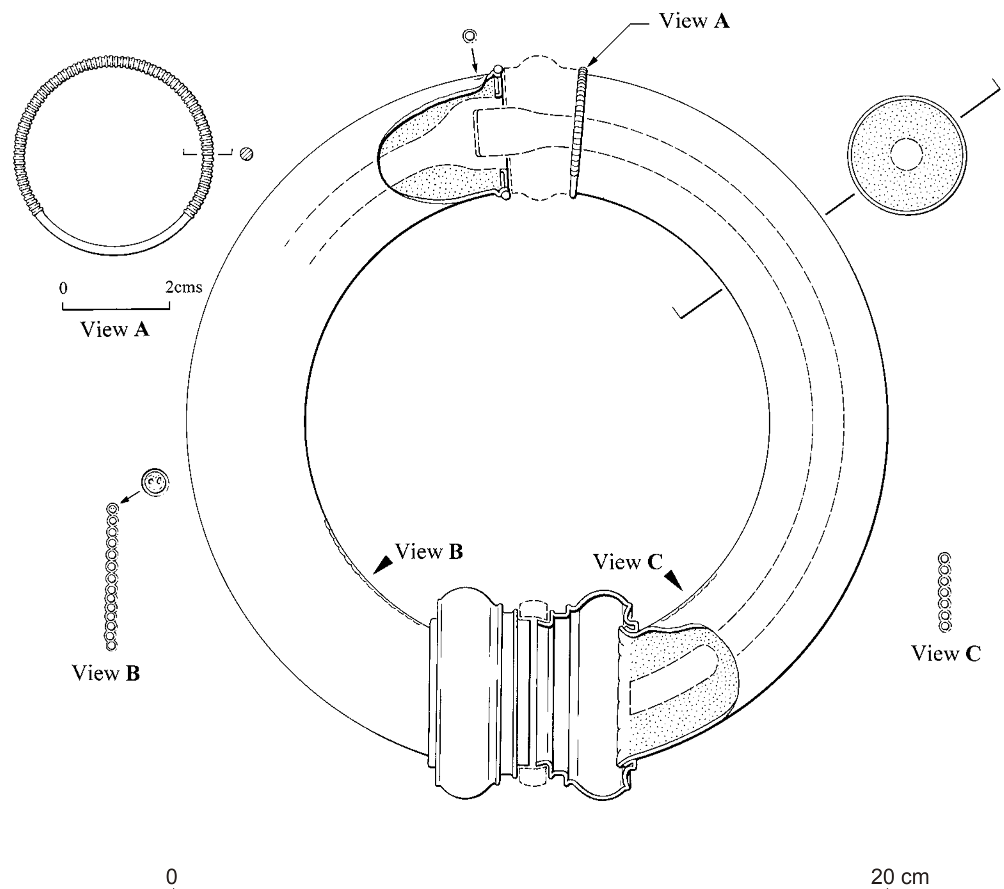


Figure 21.9 Illustration of torc A.2 (drawing by Jim Farrant)

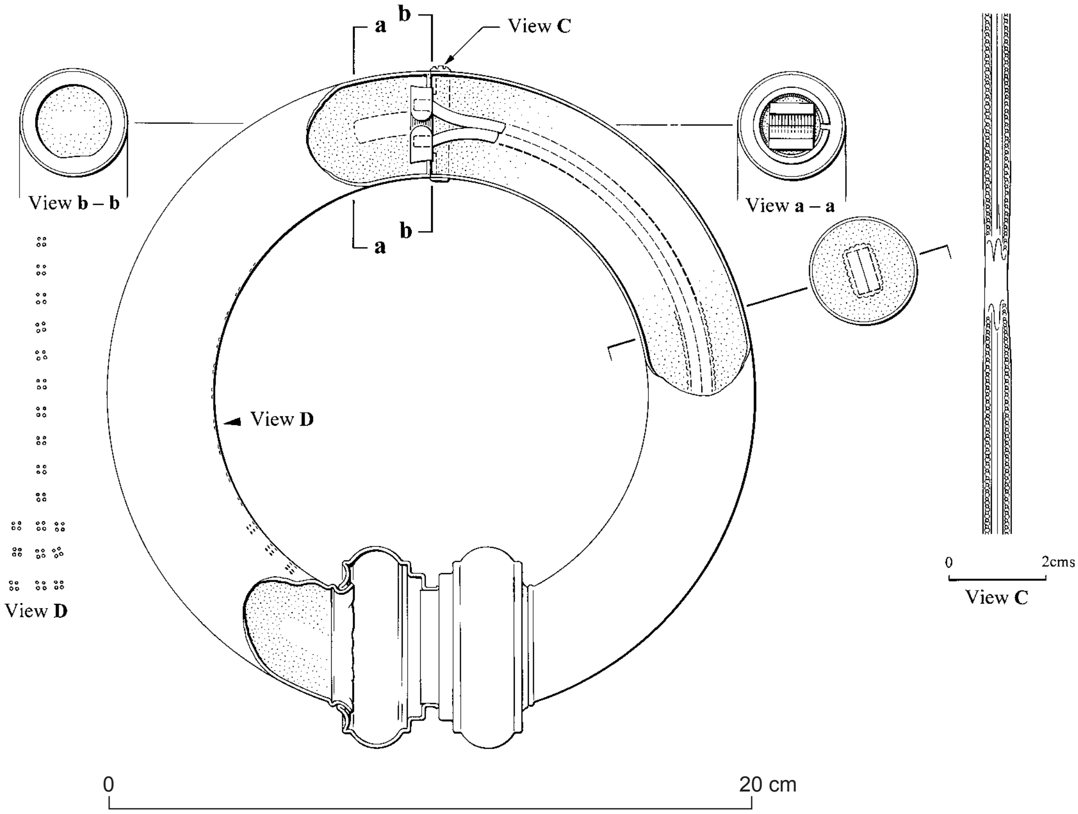


Figure 21.10 Illustration of torc A.3 (drawing by Jim Farrant)

Curvilinear

Curvilinear decoration on torcs can be broadly divided into inscribed curvilinear designs and raised curvilinear designs. Both frequently employ 'basket-weave' hatching and define the same distinctive motifs, particularly trumpets, fins, and cusp shapes, but they use different techniques. Raised decoration is most commonly fashioned through lost-wax casting (or very occasionally repoussé), whereas inscribed decoration is often engraved/chased directly onto the metal.

These two categories compare well with identified patterns in Style V art (Stead 2009). For example, many parallels can be found for raised curvilinear decoration on other contemporary objects, such as the ornament on the plaque from Llyn Cerrig Bach, Anglesey, with its

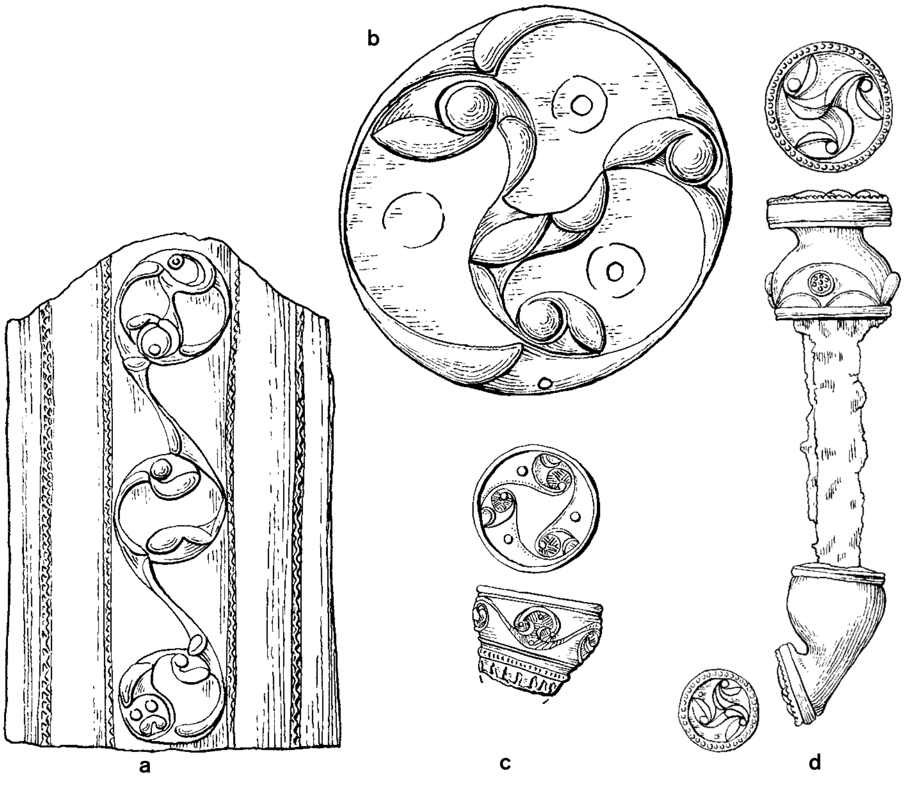


Figure 21.11 Raised curvilinear decoration on a scabbard from a) Deal, b) a plaque from Llyn Cerrig Bach, c) a torc terminal from Clevedon and d) a linch-pin from Kirkburn (drawings by Craig Williams)

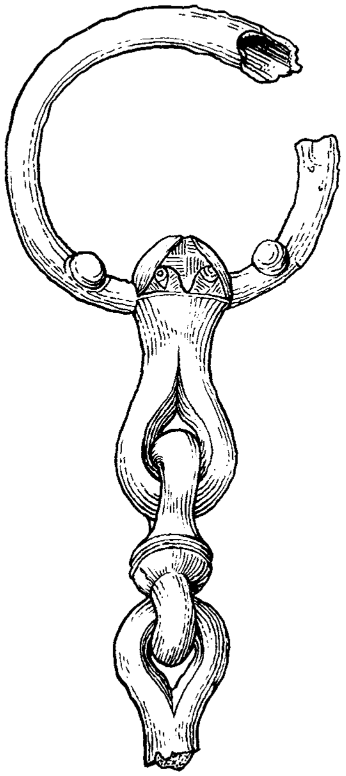


Figure 21.12 (far left) Raised curvilinear decoration on a bridle bit from Ulceby (drawing by Craig Williams after May 1976)

Figure 21.13 (left) The Desborough mirror decorated in characteristic inscribed patterns, *c.* 50 BC–AD 50. British Museum, 1924,0109.1

characteristic trumpet voids (Macdonald 2007b, no. 47, fig. 24; **Fig. 21.11b**), the Clevedon Torc from North Somerset (**Fig. 21.11c**), a sword scabbard from Deal, Kent (Stead 1995b; **Fig. 21.11a**), the linch-pins from Kirkburn, East Yorkshire (Stead 1991b; **Fig. 21.11d**), and a bridle bit from Ulceby, Lincolnshire (May 1976; **Fig. 21.12**). In terms of inscribed decoration, by far the best parallel is the decoration on mirror backs (**Fig. 21.13**) and other artefacts such as sword scabbards (see compendium in Joy 2010, app. C). An important difference here is that, in the case of torc terminals, inscribed decoration is sometimes three- rather than two-dimensional (e.g. F.43, L.13, L.20a–b).

Raised curvilinear decoration on multi-strand torcs

Possibly the best-known example of the decoration which I term 'raised curvilinear' appears on the torus terminals and collars of the so-called 'Great Torc' (E.1a), which comprises embossed ridges contrasting with areas filled by chased 'basket-weave' hatching (**Fig. 21.14**). As is the case with the inscribed decoration on torc L.20 (described below), the major areas of decoration appear towards the front of each terminal, within an oval-shaped panel with tapering wings on either side. The decoration on each terminal is different, but the patterns of both are made up of raised lobes framing hatched trumpet and circle motifs. Within two circles are two raised knobs, both with three punched dots. Within two of the trumpets are raised concentric circle motifs. The decoration on each collar is also slightly different, but the ornament on both is similar to that on the terminals, with raised lobes, raised knobs with punched dots and hatched trumpet motifs positioned on the outside face (when worn) of the torc. Overall, the pattern forms an elongated lyre with this design at its centre.

One other torus torc shows similar raised curvilinear designs, though in this case without hatching. The torus terminals and collars of torc L.21 (**Fig. 21.15**) have a deceptively simple design, made up solely of raised lobes framing plain trumpet and fin motifs. The designs on both terminals are almost identical. The collars are wider on the terminal side, and each has a plain cordon on the neck-ring side and a crimped cordon where the collar meets the head of the terminal.

Another example is a broken ring terminal, F.185 (**Fig. 21.16**). Its design is now indistinct owing to corrosion products, but the decoration on the outer edge is made up of raised lobes and knobs in an elongated lyre pattern. At the centre is a raised keeled roundel, with the relief decoration also framing trumpet motifs in the negative. These are both elements familiar from the designs on the 'Great Torc' (E.1a), and L.21.

The multi-strand torc types which most commonly exhibit raised curvilinear motifs are reel and buffer terminal torcs. The two reel terminals F.119 and F.120 (**Fig. 21.17**), a pair deriving from a single torc, are decorated on both faces in relief. Lobes, tendrils and bosses in a tripartite design are repeated on each face. A simple indented line marks the rim. The inside of the reel is undecorated, and there is a plain collar where it meets the neck-ring. Face-on, the design forms a triskele pattern with the void of the ring forming a part of the overall design.

S.48 (**Fig. 21.18**) is a cast gold/silver alloy buffer terminal, probably originally from a multi-strand torc. The face is decorated with a raised rim around the circumference, and a simple tripartite relief design forming a recessed triangular motif in the negative space in the centre. In all other cases of multi-strand buffer terminal torcs with raised curvilinear designs, the decoration is exclusively on the outside edges of the buffer terminals. On torc L.11 (**Fig. 21.19**) these are decorated on the front (as worn) in high relief (rising to a maximum of about 2.5mm

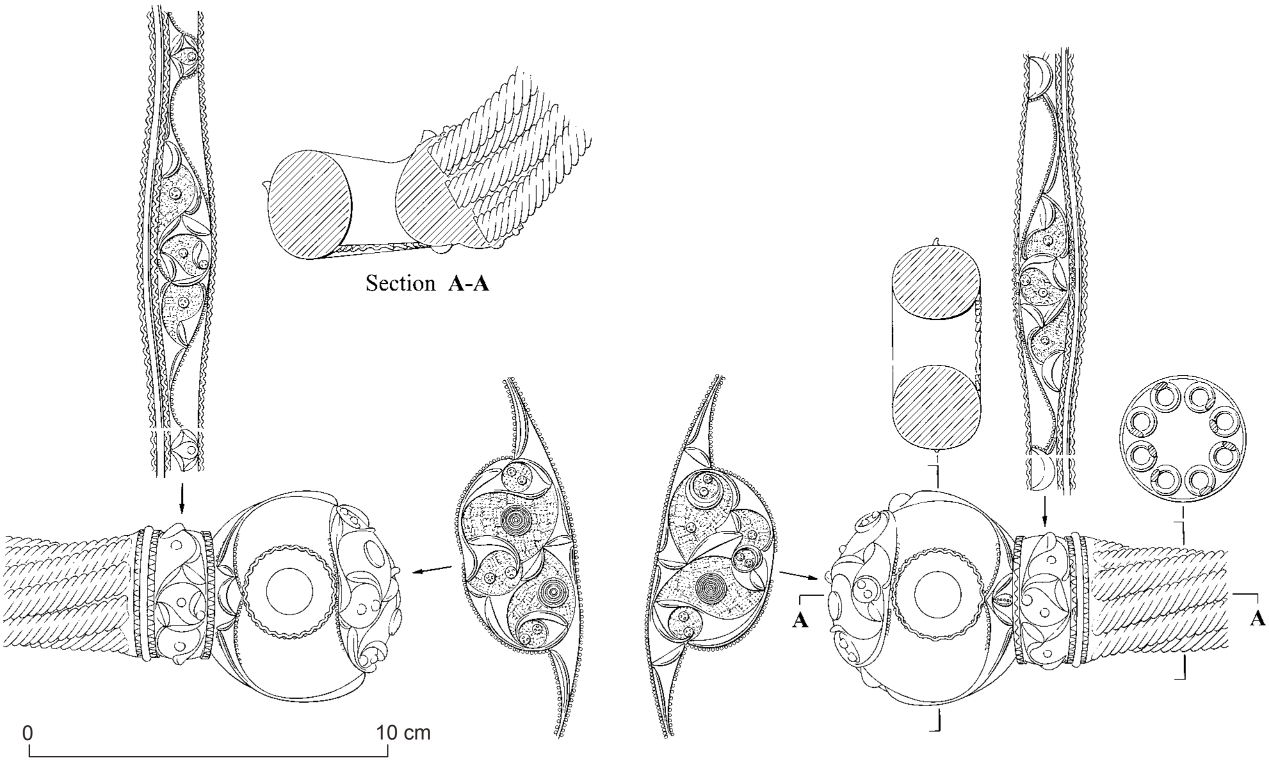


Figure 21.14 Illustration of torc E.1a (the 'Great Torc') (drawing by Jim Farrant)

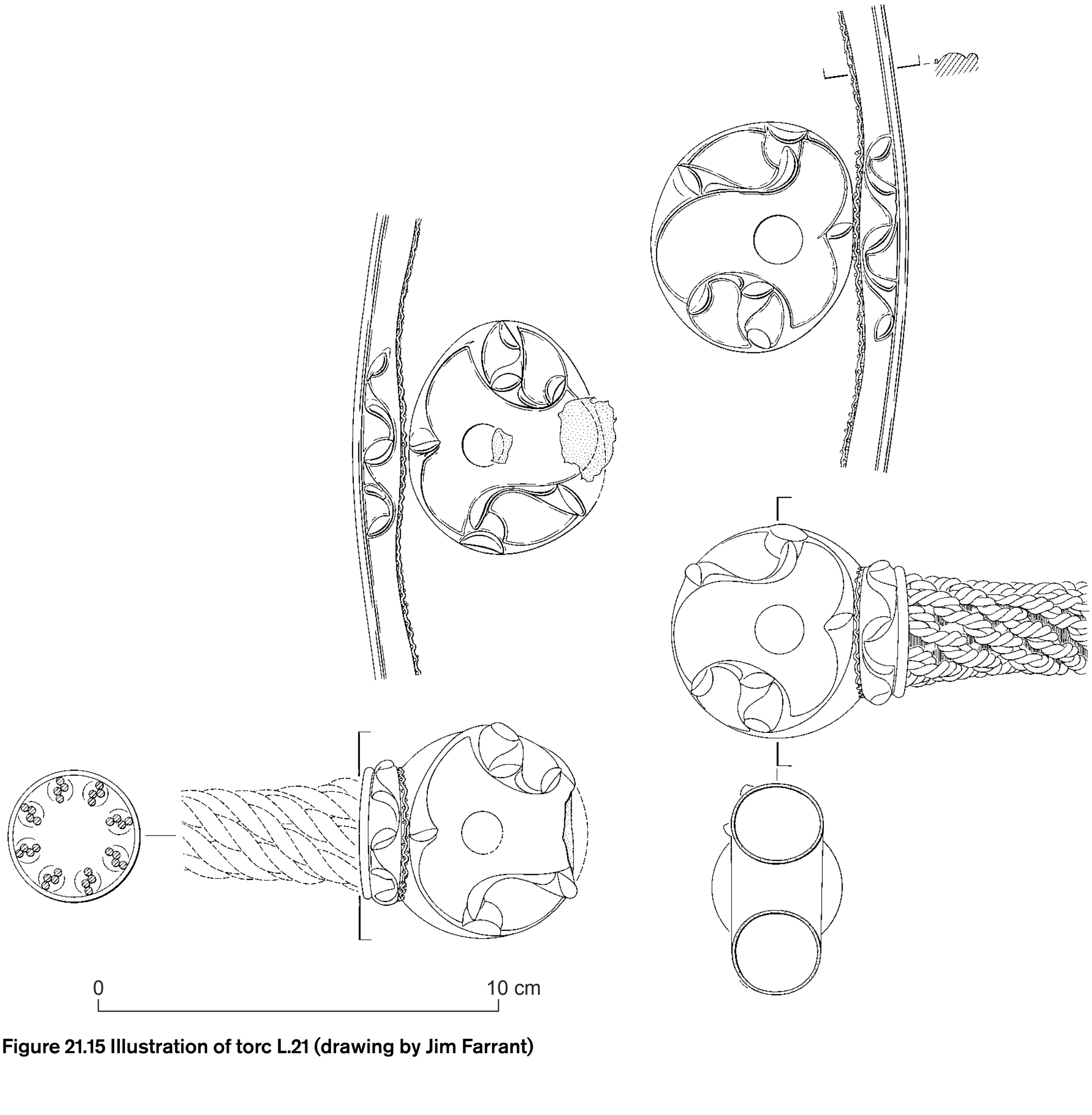


Figure 21.15 Illustration of torc L.21 (drawing by Jim Farrant)

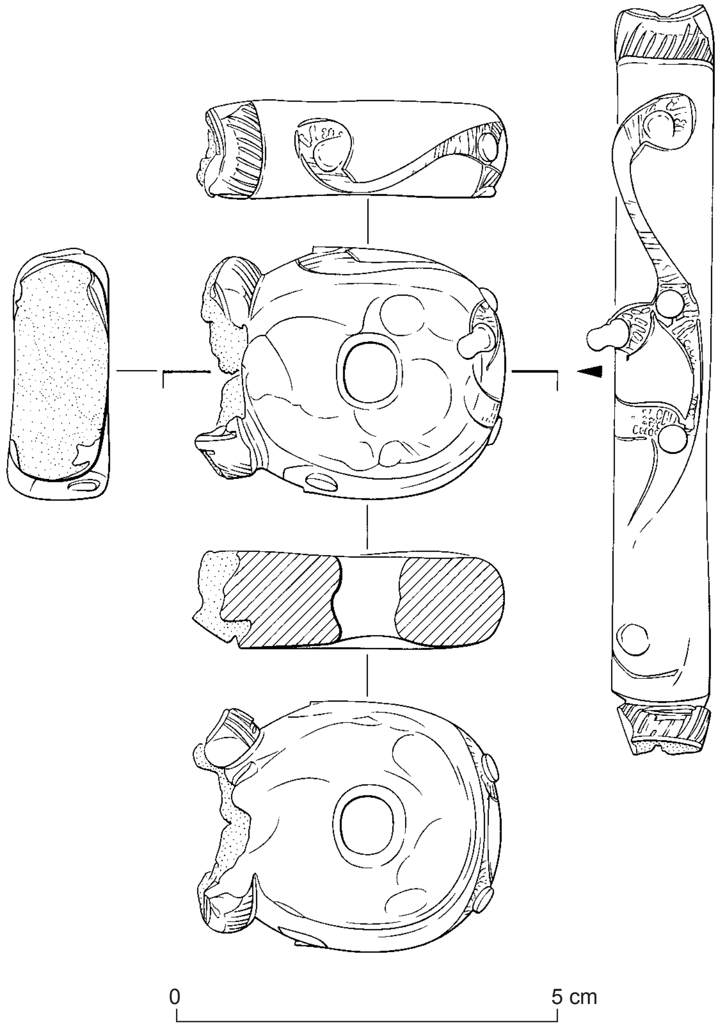


Figure 21.16 Illustration of torc F.185 (drawing by Jim Farrant)

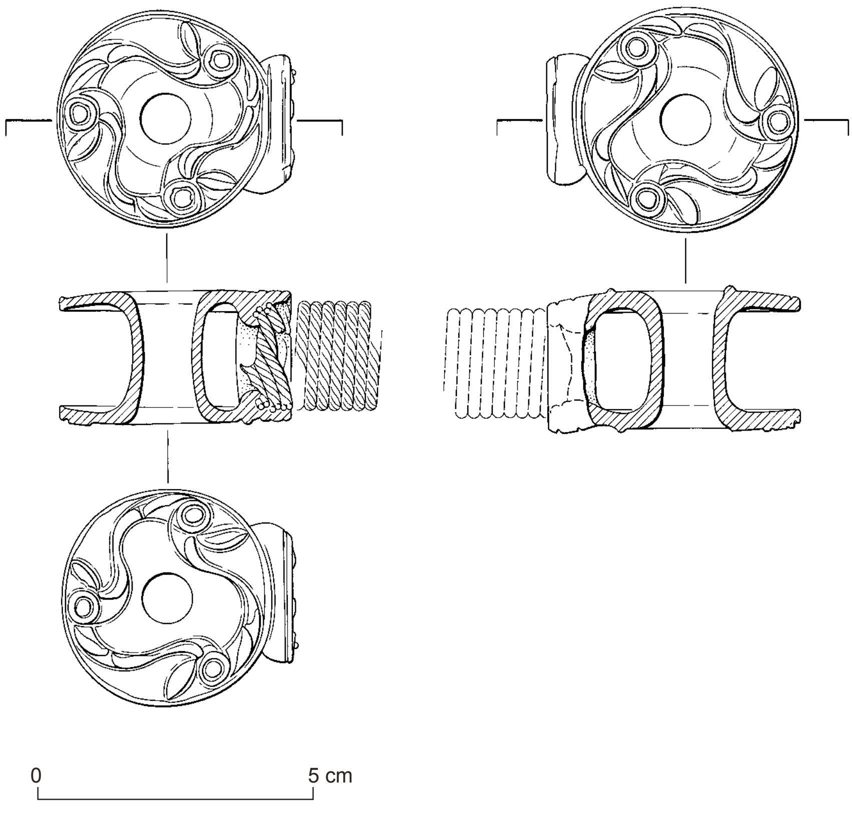


Figure 21.17 Illustration of torc F.119–120 (drawing by Jim Farrant)

above the surface) with a three-part design: a central lobe and dot set between two swags with semi-circular terminals. The orientation of the lobe and dot motif differs from one terminal to the other. The outside edge of L.12 (**Fig. 21.20**) is ornamented with raised curvilinear zig-zagging hatched petal and fin-shaped motifs. The flat face has a raised outer rim and a raised central button with a slight depression in the middle but is otherwise undecorated. In the central band around the edge of the buffer terminal of F.115 (**Fig. 21.21**), on the front (as worn) only, are six raised circled triangular motifs. There is also a simple grooved moulding around the circumference of the terminal end and a beaded moulding at the neck-ring end. The flat face of the terminal is plain.

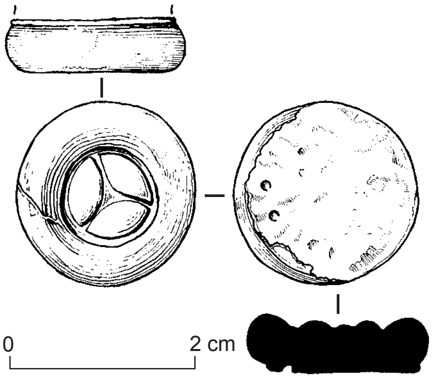


Figure 21.18 Illustration of torc S.48 (drawing by Craig Williams)

Raised curvilinear decoration on tubular torcs

Raised curvilinear decoration occurs primarily on the terminals of multi-strand torcs, but also on a small number of tubular torcs. F.6b (**Fig. 21.22**) is a gold/silver alloy fragment of Type 4 tubular torc, comprising the terminal and a section of neck-ring. The face of the terminal is decorated by concentric circles with the inside of one delineated by punch-marks. The decoration around the outside of the neck-ring, starting near the edge of the terminal, is formed of raised and chased ornament. Overall, the pattern is in the form of an elongated lyre. The background is stippled, but the raised motifs are predominantly plain, although some of the motifs, particularly the raised sections delineating the lyre, are laddered. Laddering such as this is also found on the decoration of other artefacts such as the mirror from Chilham Castle, Kent (cf. Joy 2010).

The terminal of narrow Type 1 tubular torc F.57 (**Fig. 21.23**) has a raised central triskele design which is set against

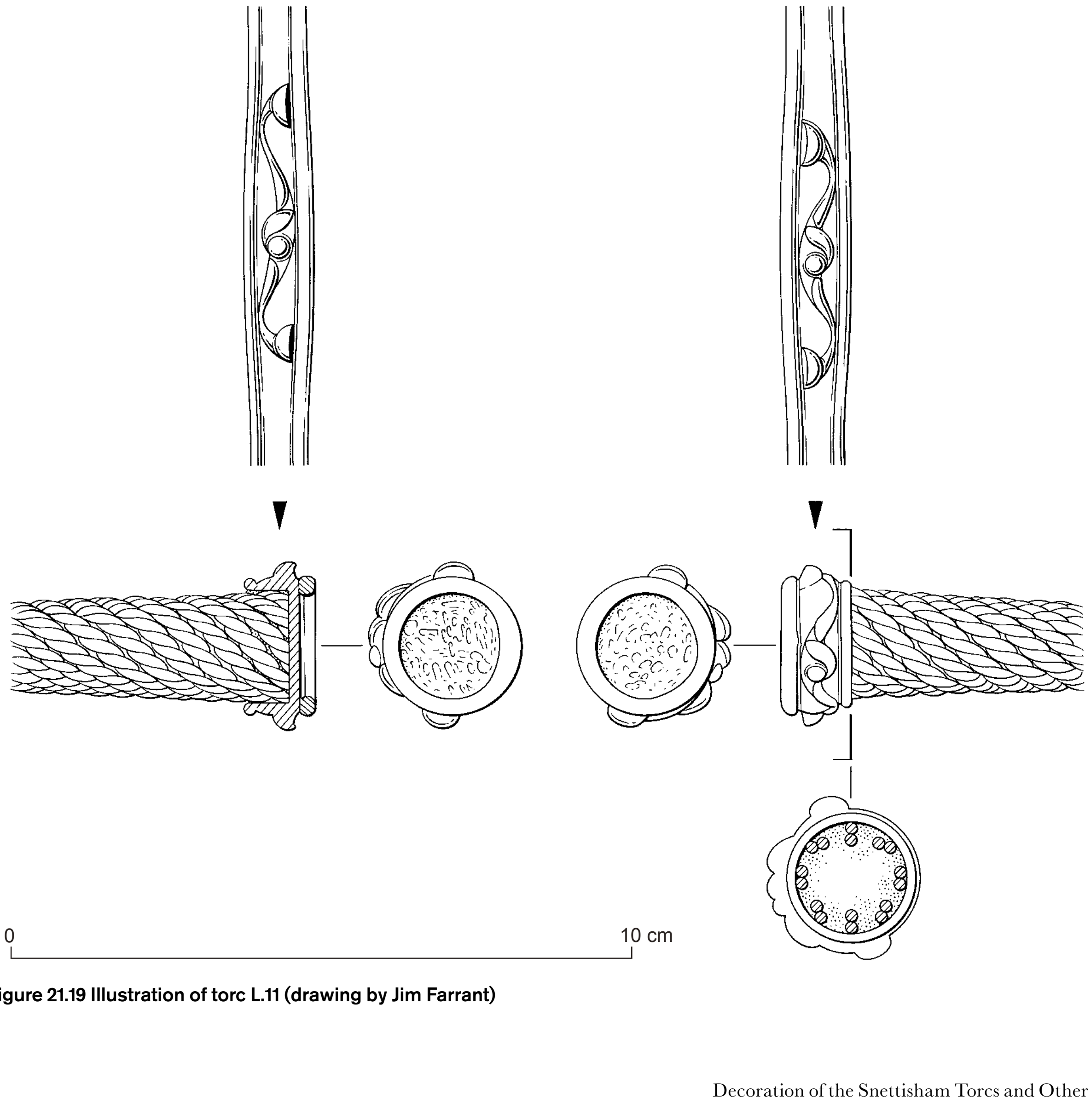


Figure 21.19 Illustration of torc L.11 (drawing by Jim Farrant)

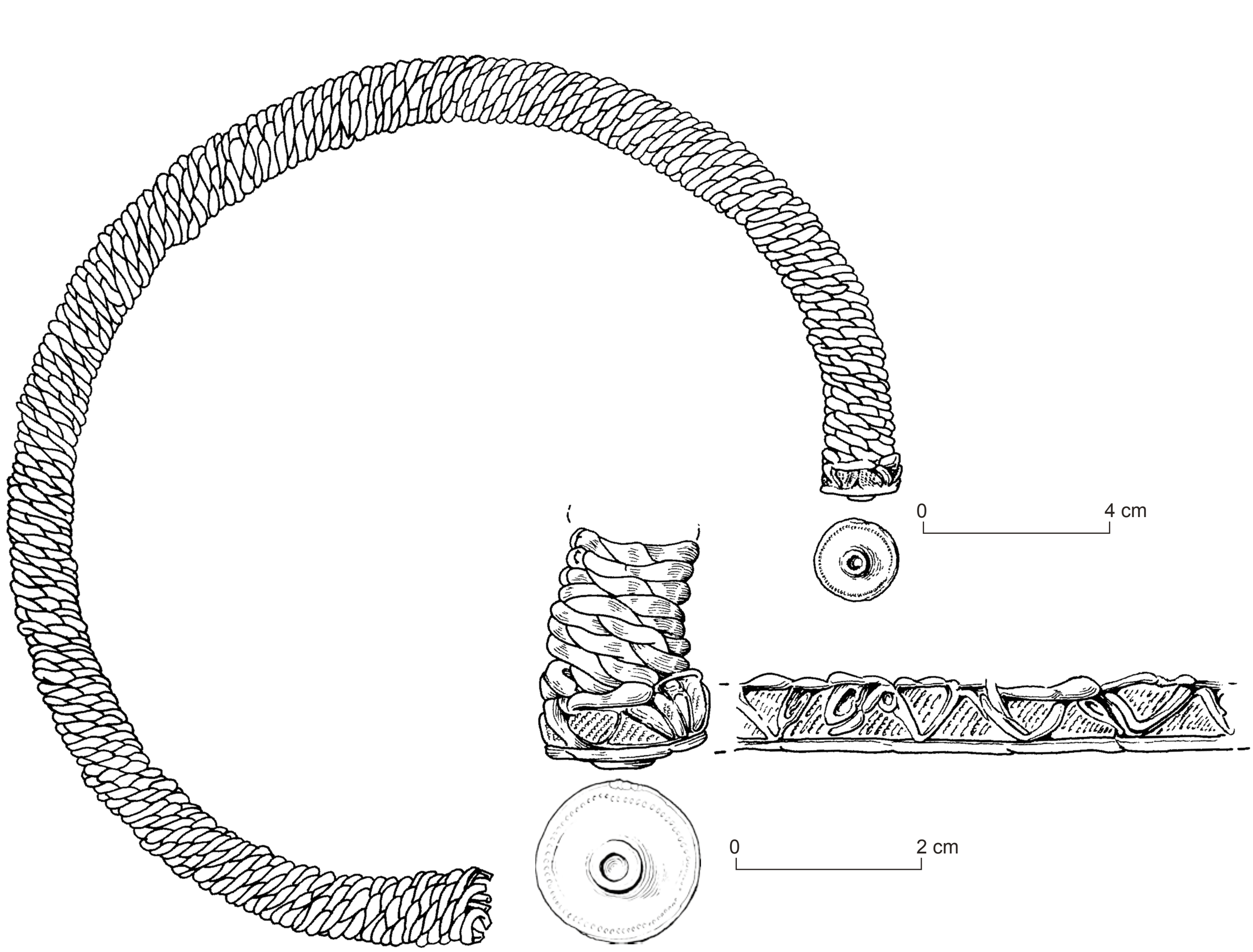


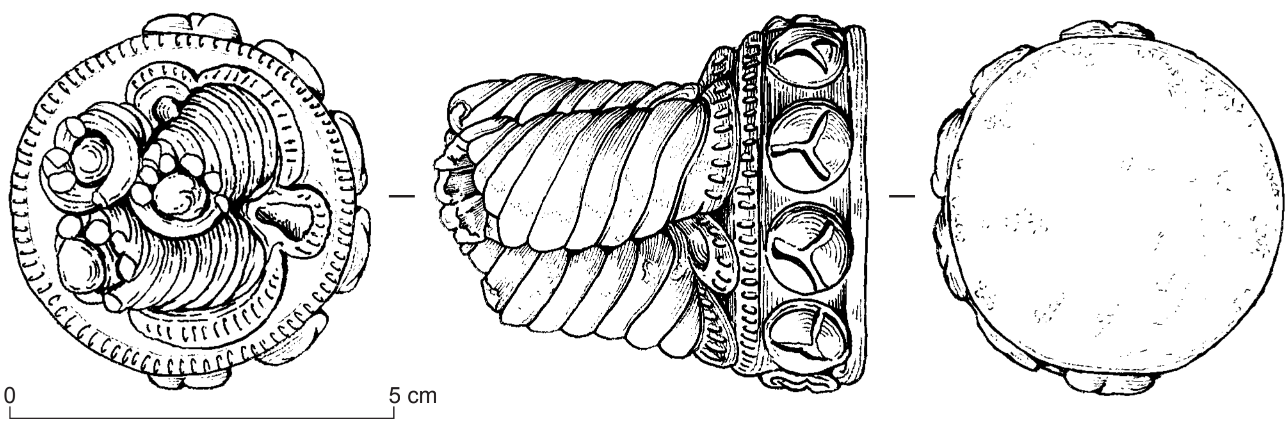
Figure 21.20 Illustration of torc L.12 (drawing by Craig Williams)

a stippled/punch-textured background. The neck-ring of Type 4 tubular torc F.46 (**Fig. 21.24**) expands towards a flat trefoil-shaped buffer terminal, the end-plate of which is decorated with a raised circular 'segmented wreath' motif. Within the wreath is a four-armed star with simple dot-punched stippled decoration.

The raised decoration on a muff positioned at the back of tubular torc A.1 (**Fig. 21.8**) is the most extensive and impressive area of raised curvilinear decoration on a tubular torc. Bordered by narrow bands arranged in a chevron pattern is a sinuous, high-relief design of repeated circles linked by two opposing lobes. Unusually, the raised circles are partitioned into quarters by a four-winged swastika motif, defined by punch-marks. The decoration on torc A.1 has a slightly different feel from the other artefacts ornamented by raised curvilinear patterns. This may be related to the fact that the raised decorative elements on this torc were produced by hammering rather than casting, though the same is also true of some sheet metal terminals (see below).

Seeking parallels elsewhere, at least two other Type 6 tubular torcs have raised decoration, though of a very different character. The tube of the tubular torc from the Broighter Hoard, County Londonderry, is intricately decorated with raised motifs, but its design is entirely in

Figure 21.21 Illustration of torc F.115 (drawing by Craig Williams)



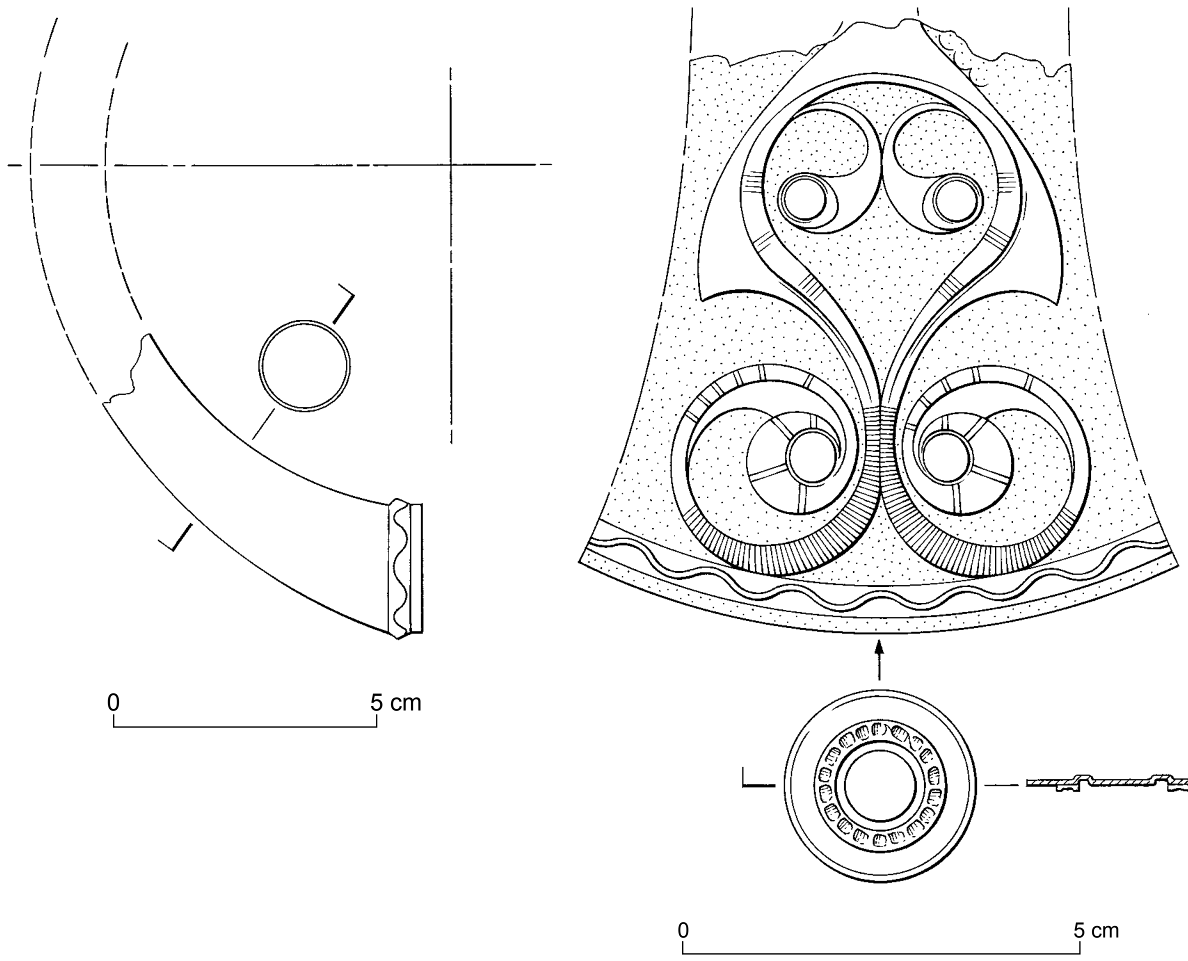
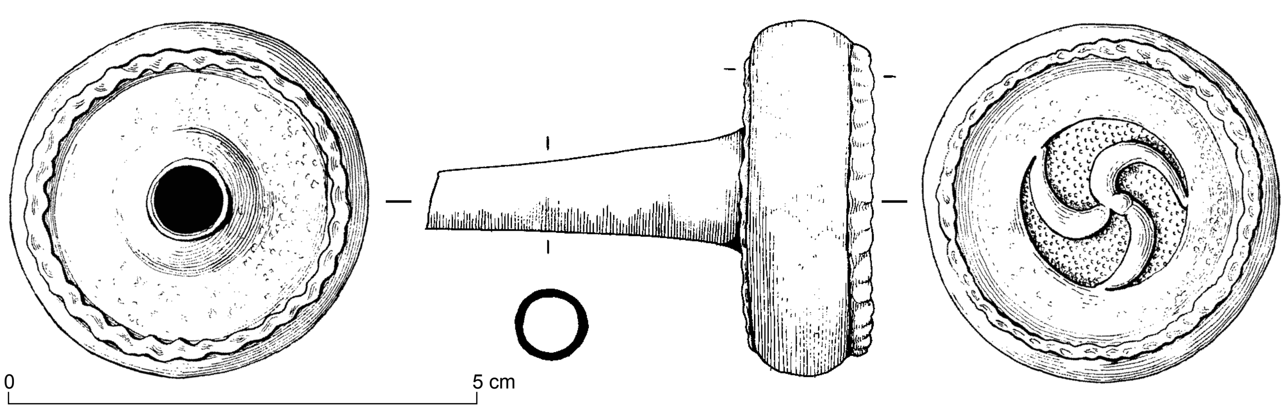


Figure 21.22 Illustration of torc F.6b (drawing by Jim Farrant)

keeping with other decorated Irish artefacts. One of the tubular torcs from the Frasnes-lez-Buissenal Hoard, Belgium (Hautenauve 2005, 194, no. 14), also has raised decoration positioned both towards the front buffers and at the back, as is the case with A.1. But here the decoration includes zoomorphic designs as well as interlinking raised reverse-S shapes; Jacobsthal (1969 [1944], 135) placed it within his Plastic Style. Piecing all of this evidence together, it seems there are precedents for decorating broad-bodied Type 6 tubular torcs with a wide variety of raised ornament and A.1 neatly fits this, particularly with its decoration being positioned at the back of the neck-ring, as is some of the decoration on the torc from Frasnes.

Beyond Britain and Ireland, Type 6 tubular torcs very similar to those from Snettisham have also been found in northern France and Belgium (Hautenauve 2005, 82–4, carte 9), e.g. Frasnes-lez-Buissenal, Belgium (*ibid.*, nos 14–15), Mailly-le-Camp, France (Joffroy 1969; Lejeune 1969), and Saint-Louis, France (Furger-Gunti 1982). However, the decoration of the Snettisham objects speaks of local rather than continental connections. Although different, the decoration on A.1 shares more similarities with British

Figure 21.23 Illustration of torc F.57 (drawing by Craig Williams)



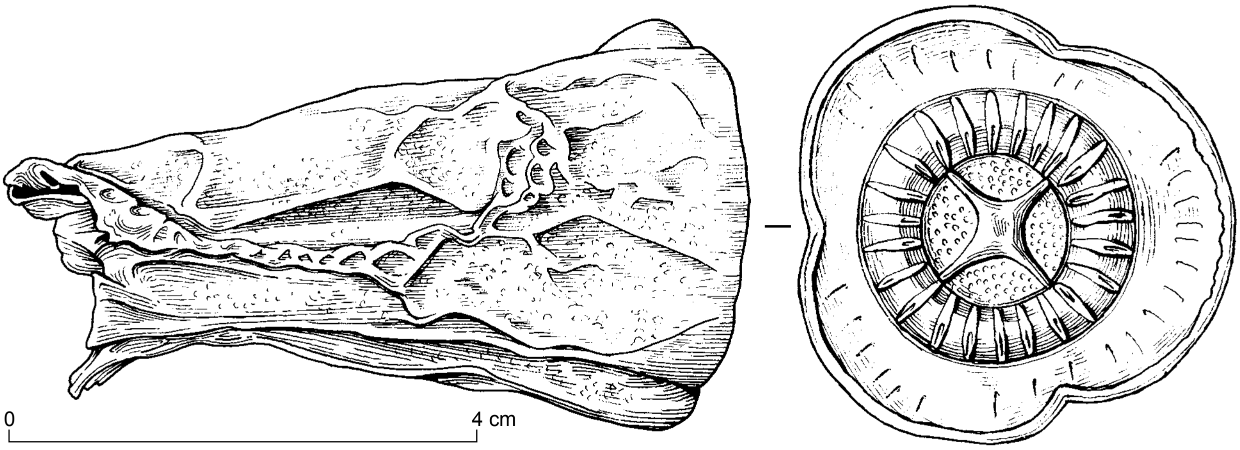


Figure 21.24 Illustration of torc F.46 (drawing by Craig Williams)

artefacts than tubular torcs found elsewhere, as is the case with the Broighter torc with its Irish-style decoration (Clarke 1954, 44). It therefore seems as though on each of these large, broad tubular torcs with raised curvilinear designs, the decoration is peculiar to the region in which the torcs were found, perhaps indicating that this is where they were also manufactured. Certainly, tubular torcs show similarities and continuities of design over a wide area, but this could be accounted for by wide contacts between groups (Joy 2015) and the production of locally produced versions rather than necessarily implying common manufacture by metalworkers based somewhere in continental Europe.

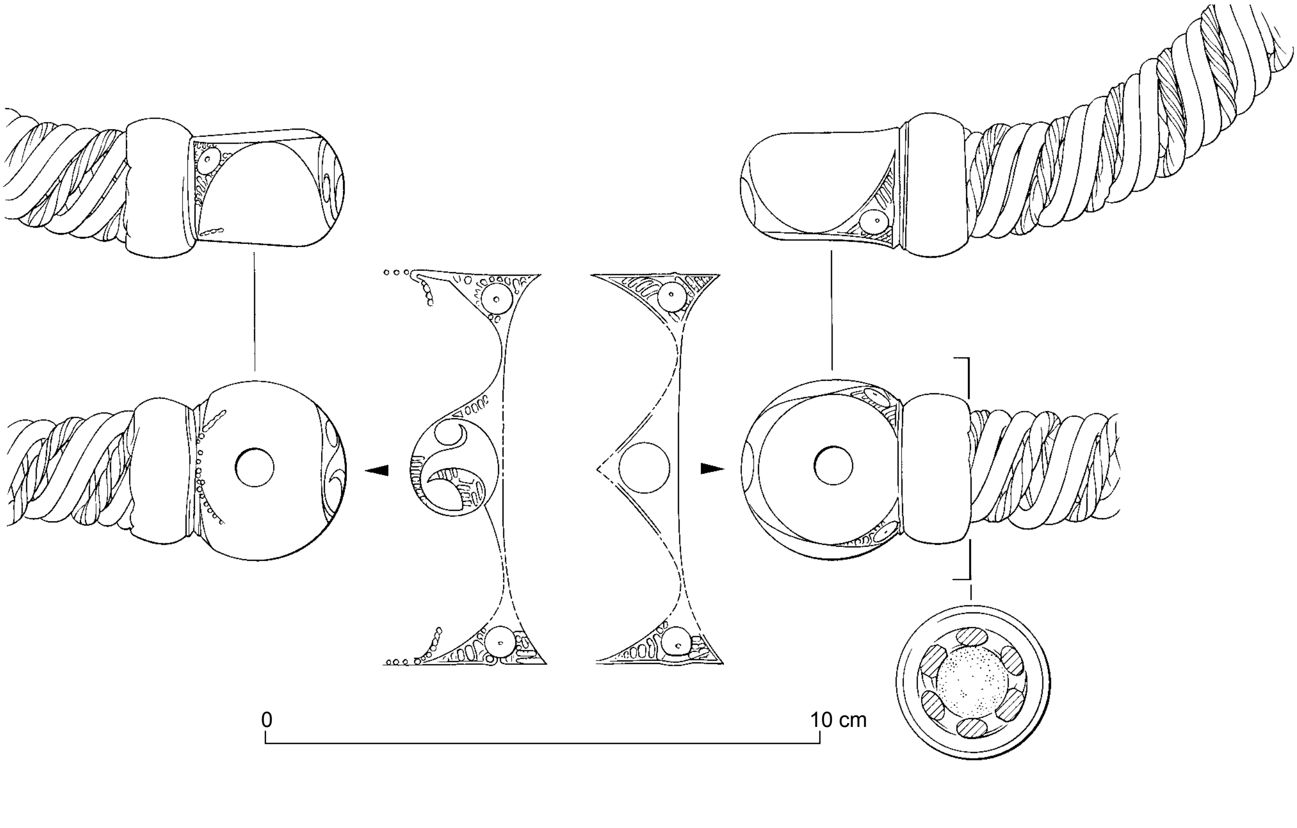
Inscribed curvilinear decoration on multi-strand torcs

A smaller number of objects exhibit two-dimensional curvilinear decoration, etched or chased directly into the surface of the metal. These include both torus and buffer terminal multi-strand torcs. Positive shapes are generally defined using hatching.

Two torus-terminal torcs (L.10a and L.20) are decorated with such inscribed curvilinear decoration. The decoration on the torus terminals of torc L.10a (**Fig. 21.25**) is very faint and heavily worn. The designs of each terminal differ slightly. The patterns of both form a wave and are delineated by an inscribed edge with most of the space infilled with hatching. At the ends of each wave are triangular shapes with unfilled circles placed off-centre in each. At the centre of one terminal is a triangular-shaped panel with an unfilled circle in the middle. In the centre of the other is a circular design formed by two linked hatched fin-motifs forming a circle, a lentoid shape and a trumpet motif in the negative.

Both torus terminals of L.20 (**Fig. 21.26**) are decorated with different inscribed designs and motifs are filled with

Figure 21.25 Illustration of torc L.10a (drawing by Jim Farrant)



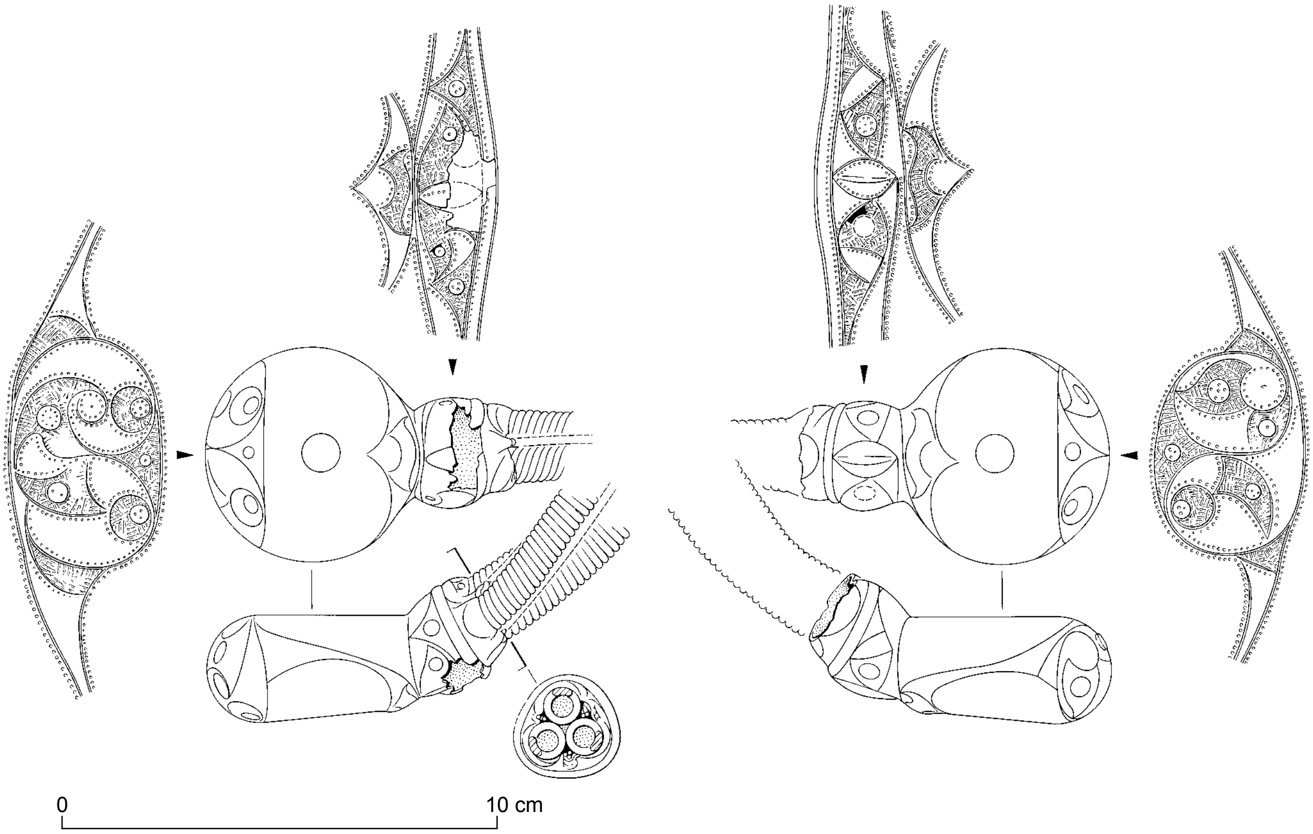


Figure 21.26 Illustration of torc L.20 (drawing by Craig Williams)

hatching set against a plain background. The designs on both terminals are split into two parts, with a zone of decoration at the front of each terminal and a second area of ornament at the other end of the ring and on the collar. The designs at the end of the terminals are oval in shape with fin-shaped 'wings' on either side (when the decoration is flattened out). The pattern and motifs are formed of inscribed lines but unusually there are also lines of punched dots on the outside of these lines. There are fin and crescent-shaped motifs, with unfilled areas forming primarily circles, fin and trumpet shapes. This decoration is also unusual for the punched dots within circular voids. They range in number from two or three to thirteen. The decoration at the collar end of the terminal and on the collar is similarly formed with the same range of motifs, but the pattern is more elongated and arranged within stretched oval and cusp-shaped zones.

Three buffer terminals from gold/silver alloy multi-strand torcs also exclusively exhibit inscribed curvilinear decoration. In two cases (S.19 and F.92), this is limited to the flat face of the terminal. S.19 (**Fig. 21.27**) is decorated with keeled-roundel and circle motifs, surrounded by three fin-shaped motifs filled with basket-hatching. F.92 (**Fig. 21.28**) is decorated on the end with a simple incised design of interlocking circles and hatched crescents. A simple raised bead runs around the edge on the outside of the terminal. In the case of L.13 (**Fig. 21.29**), the final buffer terminal torc with only inscribed decoration, the decoration includes not

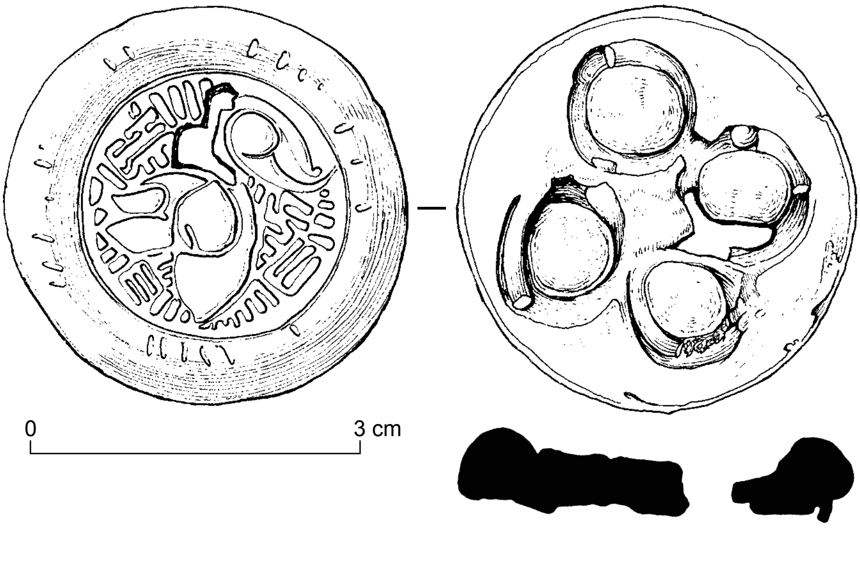


Figure 21.27 Illustration of torc S.19 (drawing by Craig Williams)

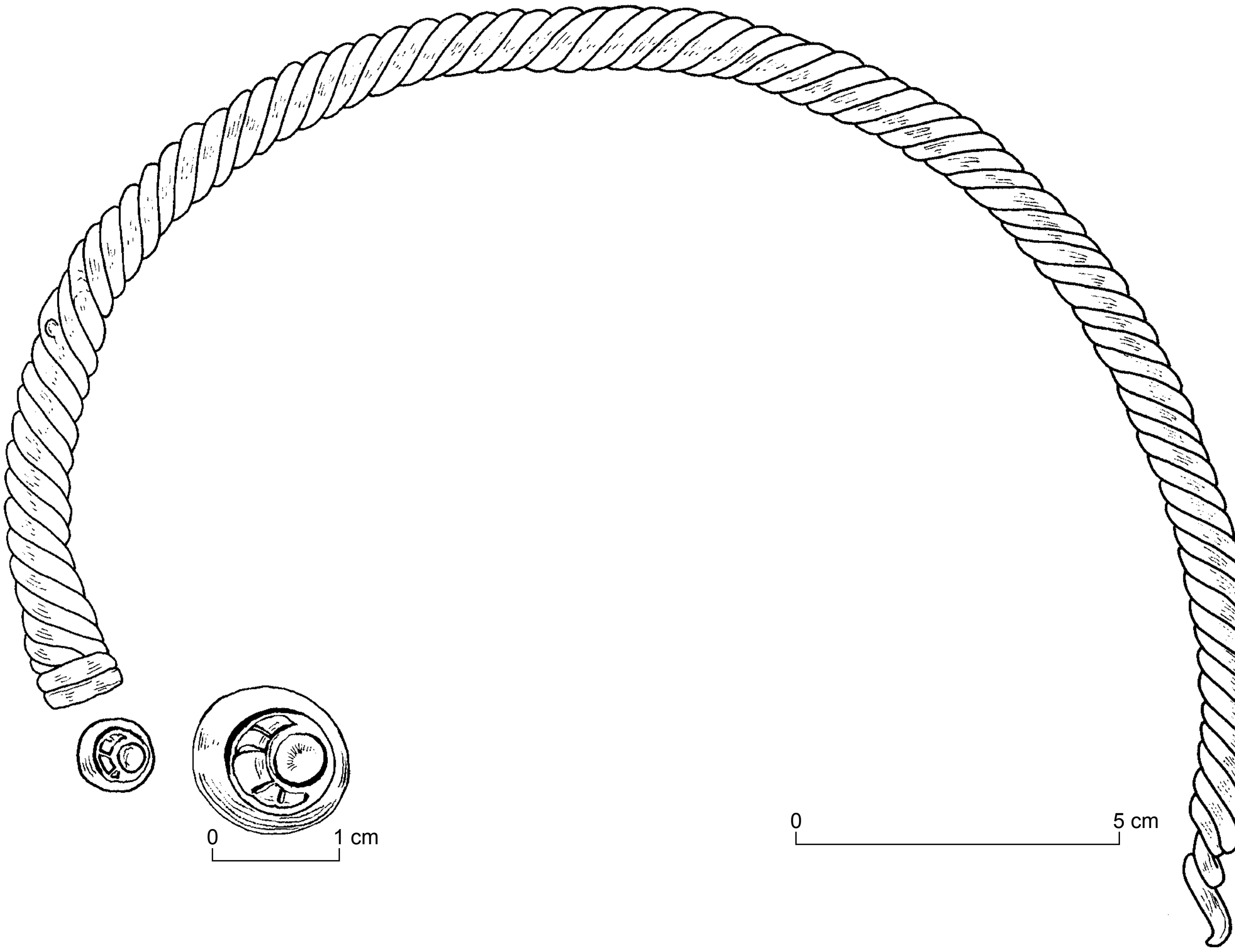


Figure 21.28 Illustration of torc F.92 (drawing by Craig Williams)

only the front face but also the curved outer rim. The face has chased/engraved decoration in the form of mirror-style motifs filled by hatching. Around the edge on the outside, there is inscribed dot-punched ornament outlining alternate teardrop and triangular shapes.

Plastic, anthropomorphic and zoomorphic decoration

Although the designs on most torcs fit relatively easily into the defined categories of raised or inscribed curvilinear (broadly speaking correlating with Stead's Style V) and non-curvilinear designs, a few torcs exhibit other types of decoration. Two appear to be influenced by Plastic Style (Stead's Style III), and two have distinctive anthropomorphic or zoomorphic designs. Others show clear mixtures of styles and are considered in the following section.

Plastic Style

Stead (1996, 26) suggested that the ornament on the Grotesque Torc (L.19a; **Fig. 21.30**) was 'strongly influenced' by the Plastic Style. Here it is also argued that the decoration on torc terminal F.72 (**Fig. 21.31**) which also stands proud (albeit not to the same extent as L.19a) could similarly be viewed as influenced by the Plastic Style. The pattern is also similar to L.19a and is made up of raised pelta and keeled roundels, creating a shape similar to a snail shell. It is interesting that both examples are also made from sheet metal. Based on evidence for high amounts of use wear, these torcs could be some of the oldest from the Snettisham hoards (Chs 20, 22). Perhaps they represent examples of an early and/or separate form of torc making (before the majority of terminals were cast) and when torc makers were more heavily influenced by designs from the continent – objects decorated in the Plastic Style are relatively scarce in Britain. Sheet-metalworking may also have lent itself to this style of decoration.

The Plastic Style is characterised by three-dimensional decoration formed in high relief and is a product of the 3rd century BC. It is certainly more prevalent on the continent than in Britain with examples identified by Jacobsthal (1969 [1944]) and others, but discoveries made in recent decades (Joy 2015) indicate that the style was by no means unknown on these islands, albeit that examples may have been quite scarce. For example, **Figure 21.32** shows three UK finds decorated with Plastic Style ornament. One is a copper alloy linch-pin from Cambridgeshire. This is similar to some examples on the continent and may represent an import or a local copy. A pin from Ropley, Hampshire, has a head decorated with similar high-relief ornament. Part of another pin decorated in the same style has since been discovered at Wield, also in Hampshire.

It is difficult to draw conclusions from such a small number of discoveries, but it is possible the two pins might represent a local tradition of the use of Plastic Style art in Hampshire, and/or the work of a particular workshop. Similarly, the two examples from Snettisham (L.19a and

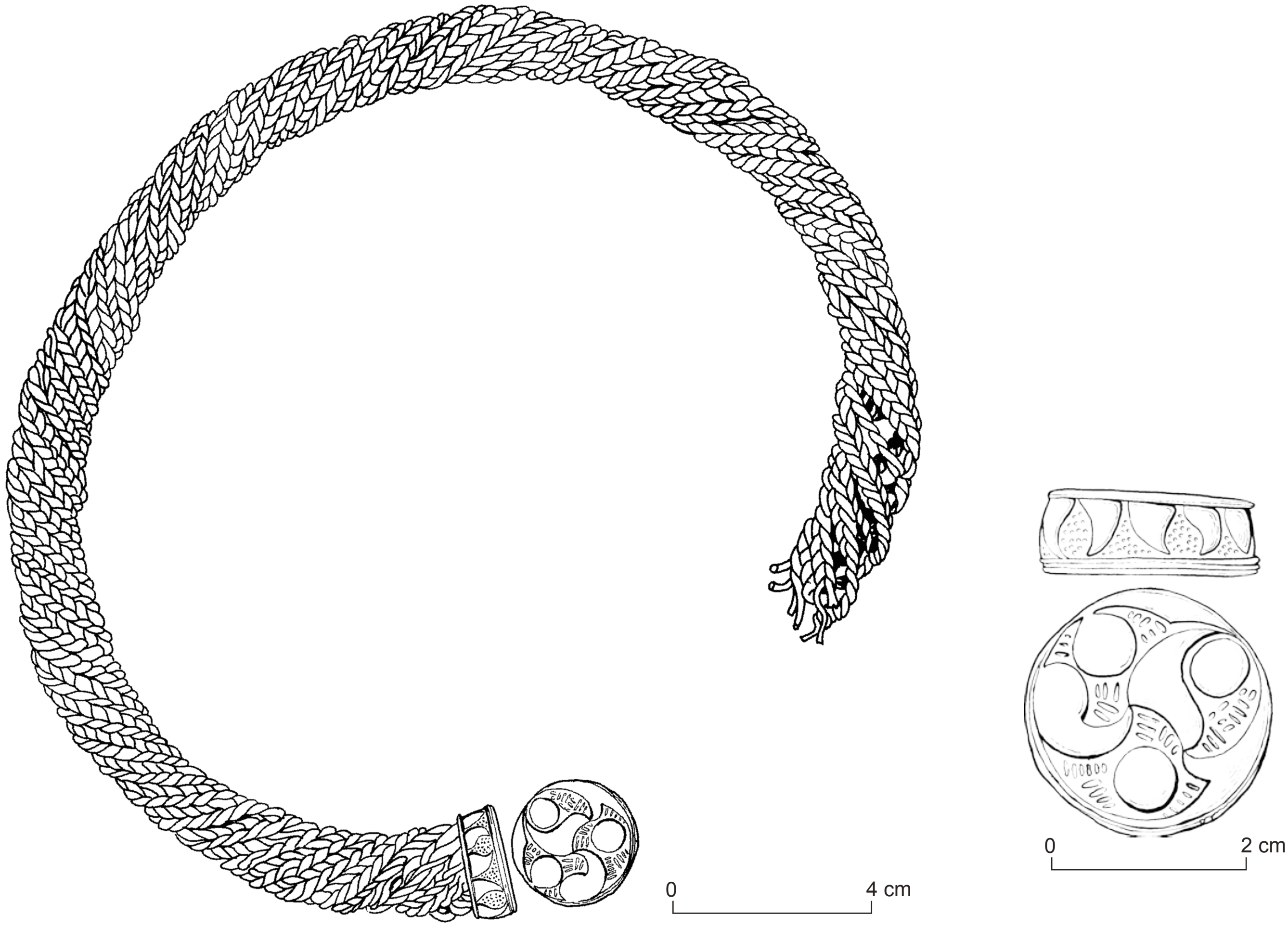


Figure 21.29 Illustration of torc L.13 (drawing by Craig Williams)

F.72) may characterise a specific phase or local tradition of torc making which is probably older than that represented by most of the objects from the Snettisham hoards.

Anthropomorphic

Interpretation of art is always subjective. Some patterns (such as those appearing on the muffs of the Grotesque Torc, L.19a, **Fig. 21.30**) can be interpreted as faces. But here we restrict our categorisation to clearer representations of the human form with defined features (two eyes, a nose and a mouth), as we do below for animal forms. According to this criterion, only one of the Snettisham torcs, S.13, is decorated with a design which could be described as anthropomorphic. It is also an example of mixed decorative styles, as the torc also has non-curvilinear decoration.

S.13 (**Fig. 21.33**) is a fragment of gold/silver alloy narrow-bodied Type 4 tubular torc. The terminal survives but the neck-ring is broken at the opposite end, and the whole fragment is bent into a tight V-shape. It is decorated with raised and inscribed decoration with a raised sinuous band surrounded by a series of concentric circles, wavy lines and areas of stippling. Near the terminal is a humanoid face with raised, lentoid-shaped eyes, concentric circles for irises and pupils, and even eyelashes. The image is abstract, but it is unmistakably a human face. Above the eyes, a cusp-shaped motif could be seen to form the forehead or hairline.

Some other Late Iron Age anthropomorphic images, like the bucket escutcheons from Aylesford, Kent (**Fig. 21.34**), appear to be wearing a hat or headdress. The same cusp motif seen on torc S.13 here provides the impression of a horned helmet. Citing other similar examples, such as the bucket escutcheons from Baldock, Hertfordshire, and a silver coin of Tasciovanus, Fitzpatrick (2007, 303–5) suggested these images could depict a religious practitioner or authority. They may also represent deities. It is unclear why this image appears on a torc. Perhaps this particular example was meant for a religious practitioner or for a specific type of event.

It is also important to consider what this decoration did. The face on S.13 is less obvious than, for example, related images on the Aylesford and Baldock buckets. This is achieved by portraying minimal yet unmistakable elements of the human face. The image on S.13 draws the viewer in, with playful details such as the eyelashes and angular nose acting to hold their attention.

Zoomorphic

S.83 (**Fig. 21.35**) is a curved section of copper alloy rod, broken at both ends, with relief zoomorphic decoration in the form of a stylised animal head with flaring nostrils. The surfaces have been partially hammered flat to give a squarish cross-section, suggesting that the object was deliberately broken up and damaged in antiquity. It is most likely part of a torc or bracelet. The closest parallels are from north-eastern France, dated between *c.* 350–250 BC (cf. Stead and Rigby 1999, 70–1; BM ML.1709). The lack of

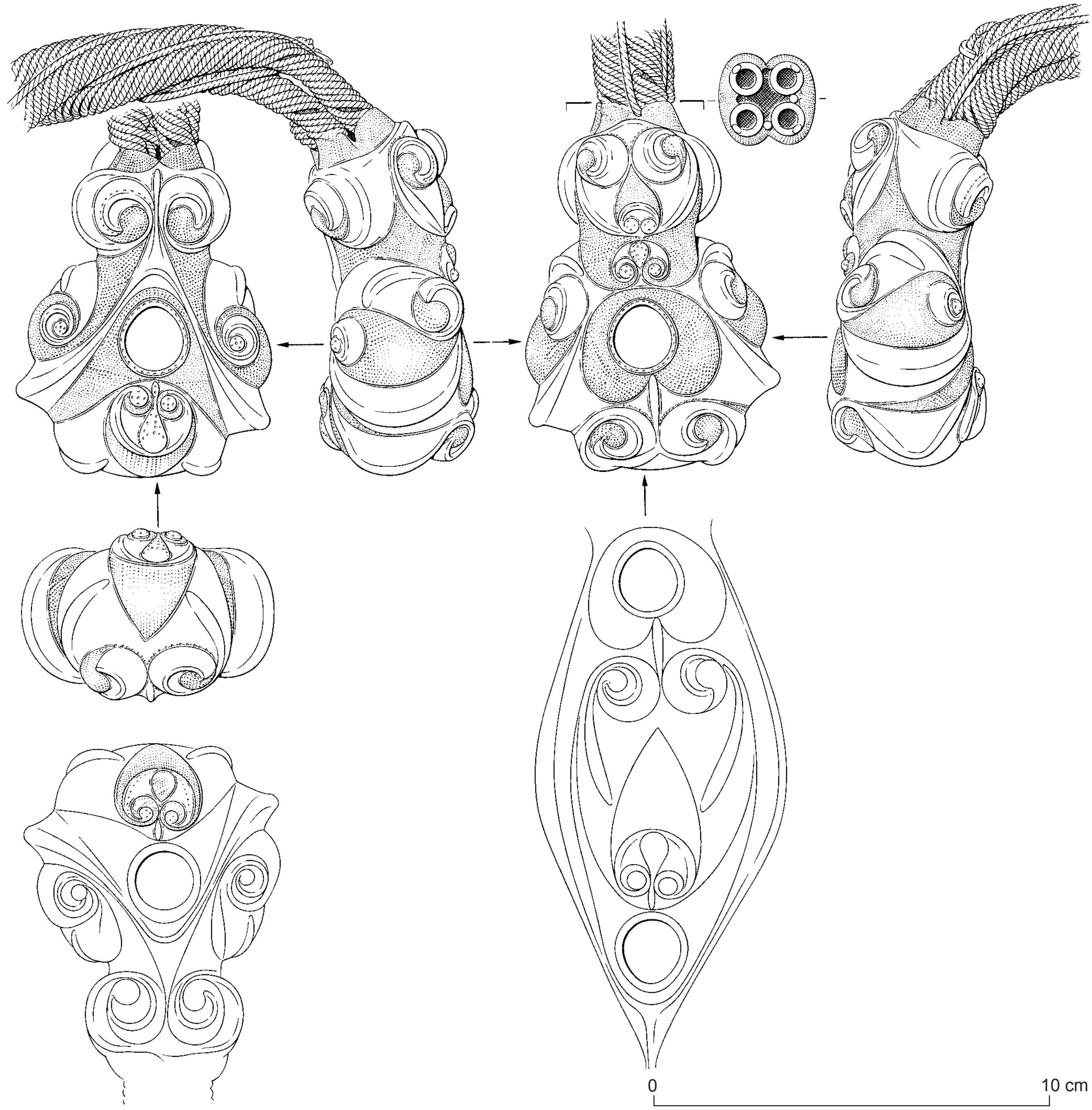


Figure 21.30 Illustration of torc L.19a (the so-called 'Grotesque Torc') (drawing by Jim Farrant)

close equivalents at Snettisham or elsewhere in Britain may suggest that this was an imported continental object.

Mixtures of styles

The mixing of styles on torcs takes three broad forms: mixing of curvilinear and more geometric motifs ('curvilinear and non-curvilinear'), mixing 'raised curvilinear' and 'inscribed curvilinear' decoration, and mixing motifs from different styles of Celtic art.

Mixing curvilinear and non-curvilinear decoration

Relatively few torcs mix both curvilinear and geometric decoration. Complete tubular torc A.1 (**Fig. 21.8**) has a raised curvilinear pattern, but much of the rest of the ornament is made up of non-curvilinear patterns, in particular circular punch-marks, chevrons created by inset wire, and perhaps the reoccurring swastika motifs seen within the raised domes of the curvilinear design. F.46 (**Fig. 21.24**) combines a very similar segmented wreath to that seen on (non-curvilinear) F.42 with a curvilinear four-armed star pattern. F.31a (**Fig. 21.36**) is a gold alloy terminal and neck-ring fragment of Type 5 tubular torc. Although heavily distorted, it is possible to make out much of the pattern, partly thanks to extensive conservation work (Ch. 16). The neck-ring is ornamented with non-curvilinear designs similar to those outlined above for torcs decorated exclusively in this style. Rectangular, triangular and diamond-shaped zones are defined by parallel lines and chevrons. Various zones contain inscribed motifs, including concentric circles and curvilinear fin motifs.

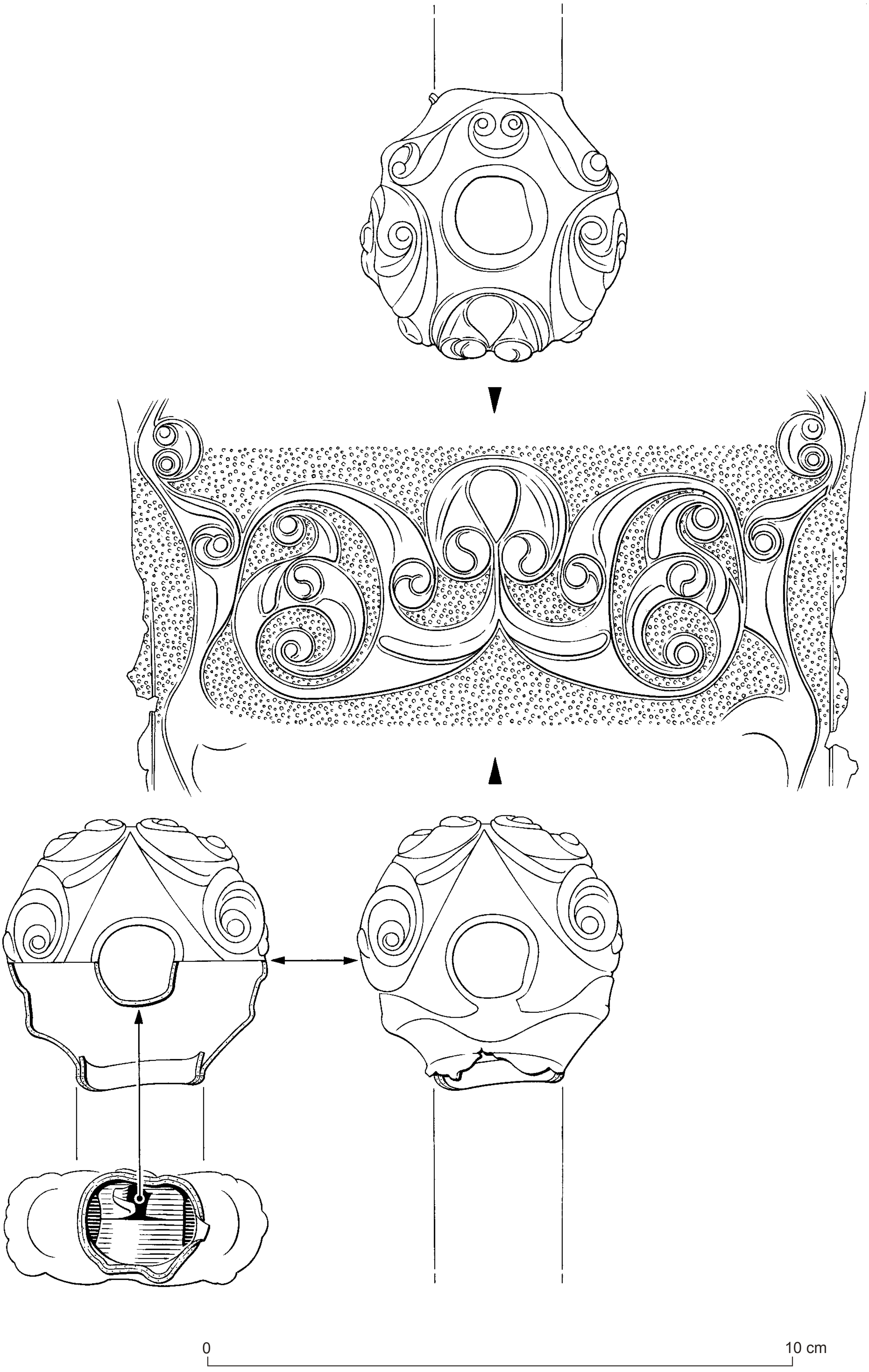


Figure 21.31 Illustration of torc F.72 (drawing by Jim Farrant)

Figure 21.32 Other artefacts from Britain decorated in the Plastic Style: a) pin from Wield, Hampshire (PAS ID: HAMP-A63ECB); b) pin from Ropley, Hampshire (PAS ID: HAMP-C319B7); c) possible linch-pin head from Cambridgeshire (British Museum, 2013,8044.1; drawing by Craig Williams)

Backgrounds also differ and include dimples, regular dots, and plain areas. The flat(ish) terminal is decorated in a different style. The overall pattern forms a rough lyre-shape with an opposing pair of swirls flanked by an arrangement of fin motifs and tendrils. The motifs are plain, and the background is stippled. Of note are the tendrils at each end of the pattern. Whilst the overall design is of a similar style to the decoration on many of the other torcs (fitting broadly into Stead's Style V), the tendrils clearly reference the so-called Vegetal Style (Style II of Stead's classification).

Mixing different styles of Celtic art

In addition to F.31a (**Fig. 21.36**), described above, which mixes Style II and Style V, perhaps the most individual design on any of the torcs appears on F.43 (**Fig. 21.37**), another piece reshaped as part of the conservation programme (Ch. 16). A fragment of gold alloy Type 5

Figure 21.33 Illustration of torc S.13 (drawing by Craig Williams)

Figure 21.34 Escutcheon from the Aylesford bucket (drawing by Craig Williams after Brailsford 1975a, fig. 131). British Museum, 1886,1112.3

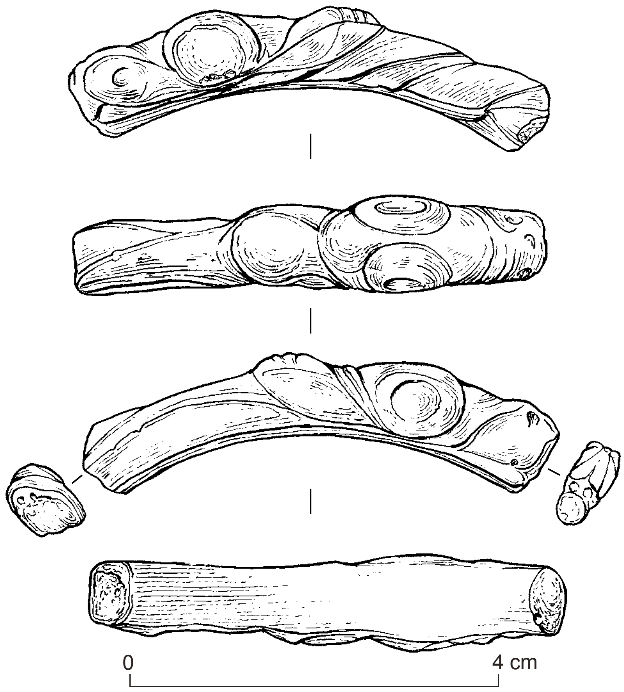


Figure 21.35 Illustration of torc S.83 (drawing by Craig Williams)

tubular torc, the decoration extends across the terminal and much of the neck-ring, comprising embossed curvilinear motifs on a punch-textured background. The overall pattern is broadly formed of two lyres, one sitting on top of the other. Much of the composition is formed of cusp and crescent shapes filled by small punch-marks and larger dots. Five decorated panels are also framed within the composition, each filled with an individual motif. Located immediately below the main decoration is a pelta shape.

Of great interest here is that the design mixes elements from at least two of Stead's Celtic art styles. Without the panels, the design would fit easily into Style V, whereas the decoration within the panels more closely corresponds to other styles. Stead (2009, 327, fig. 1) linked them to La Tène I motifs, and other connections are also apparent. For example, parallels to the motif labelled 'E' in **Figure 21.37** can easily be identified on the inscribed design on the central section of the Wandsworth shield boss, SW London (**Fig. 21.38a**) and the sword scabbards from Wetwang Slack, East Yorkshire (Stead 2006, nos 173–4). The way in which individual motifs are framed inside discrete panels also recalls the Wandsworth shield boss (**Fig. 21.38b**), on which areas of incised decoration are sectioned-off by raised ornament. These artefacts belong to Stead's Style IV, within the so-called 'Witham-Wandsworth Style' (Stead 1996, 31).

Mixing inscribed and raised curvilinear decoration

Just one torc could be seen to mix flat, 'inscribed curvilinear' decoration with relief or 'raised curvilinear' decoration. F.106 (**Fig. 21.39**) is the buffer terminal of a multi-strand gold/silver alloy torc. On its face there is a roughly engraved circular design comprising basket-hatch-filled trumpet motifs and a surrounding ring of punched dots. The outside, however, is decorated in relief with nine small dot-punched domes set in a basket-hatched field. This relief decoration is not in itself curvilinear, but it echoes the knobs with punched dots seen on torcs with 'raised curvilinear' designs, such as E.1a.

The rarity of combining 'inscribed curvilinear' and 'raised curvilinear' motifs on torcs is likely due to the different manufacturing processes involved. Inscribed curvilinear designs are generally chased or engraved onto otherwise finished terminals after casting, whereas raised curvilinear designs are either lost-wax cast or (in rare instances) sheet-worked (Ch. 17; Machling and Williamson 2018). On sheet-worked pieces, inscribed texturing is also often added, but the form of the curvilinear motifs themselves is defined three-dimensionally rather than two-dimensionally. For cast terminals, it seems that there were two production routes. Makers might choose to cast relatively plain terminals and decorate these with inscribed curvilinear designs at a final stage in manufacturing, or even later in the life of the object. Alternatively, they might mould more complex three-dimensional curvilinear designs which then formed part of the casting. These were occasionally augmented with chased or engraved texturing (such as hatching), but generally not with inscribed curvilinear motifs. These could represent preferences of individual makers or workshops, or different object biographies.

Other decorated objects

Bracelet from Hoard E (E.1c)

The sections above discussed the decoration on torcs, but other decorated object types are also present at Snettisham. The gold/silver alloy bracelet from Hoard E (**Fig. 21.40**) is hollow, being formed from sheet metal. The outside edge is decorated and there is a join running around the inside. The

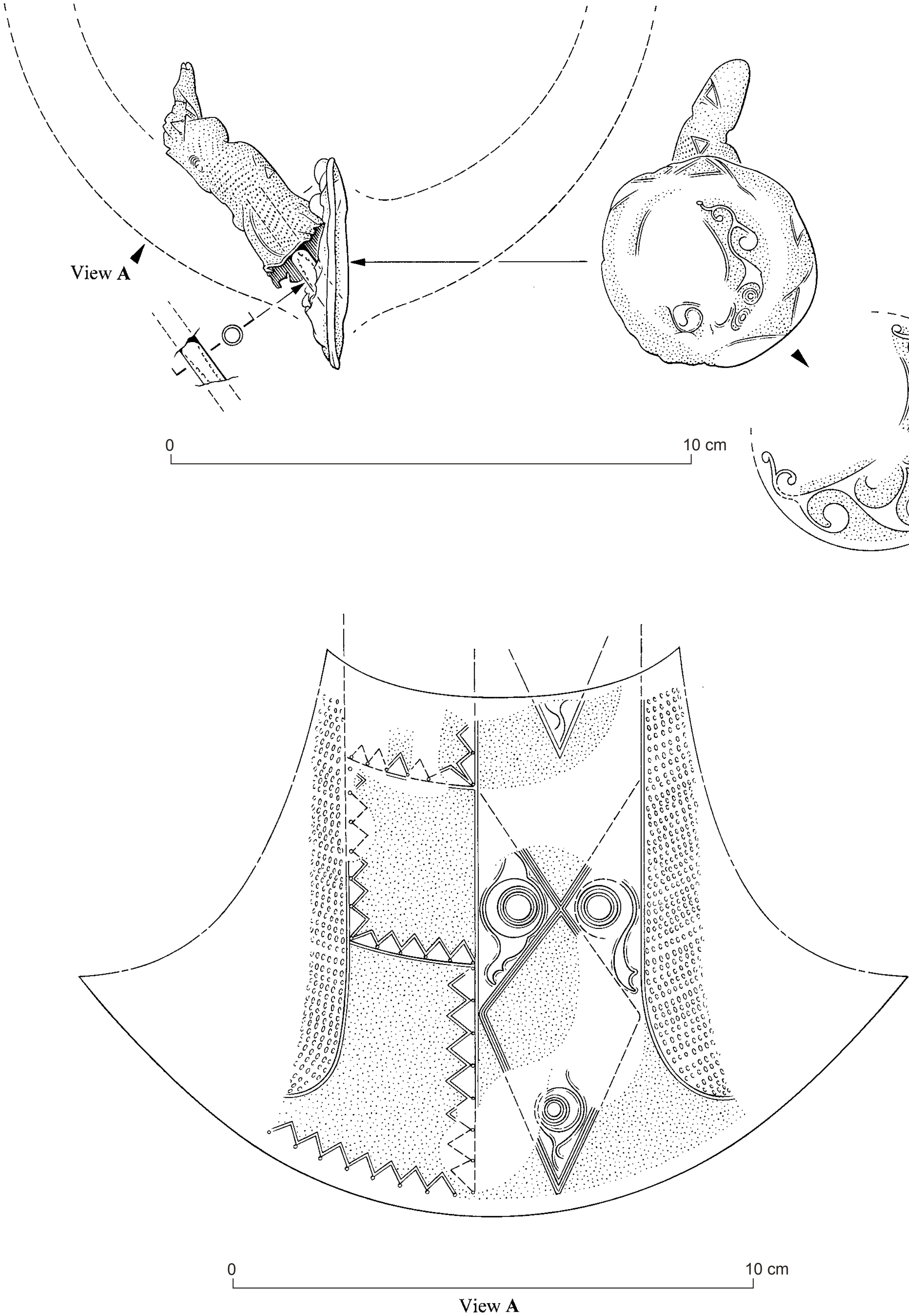


Figure 21.36 Illustration of torc F.31a (drawing by Jim Farrant)

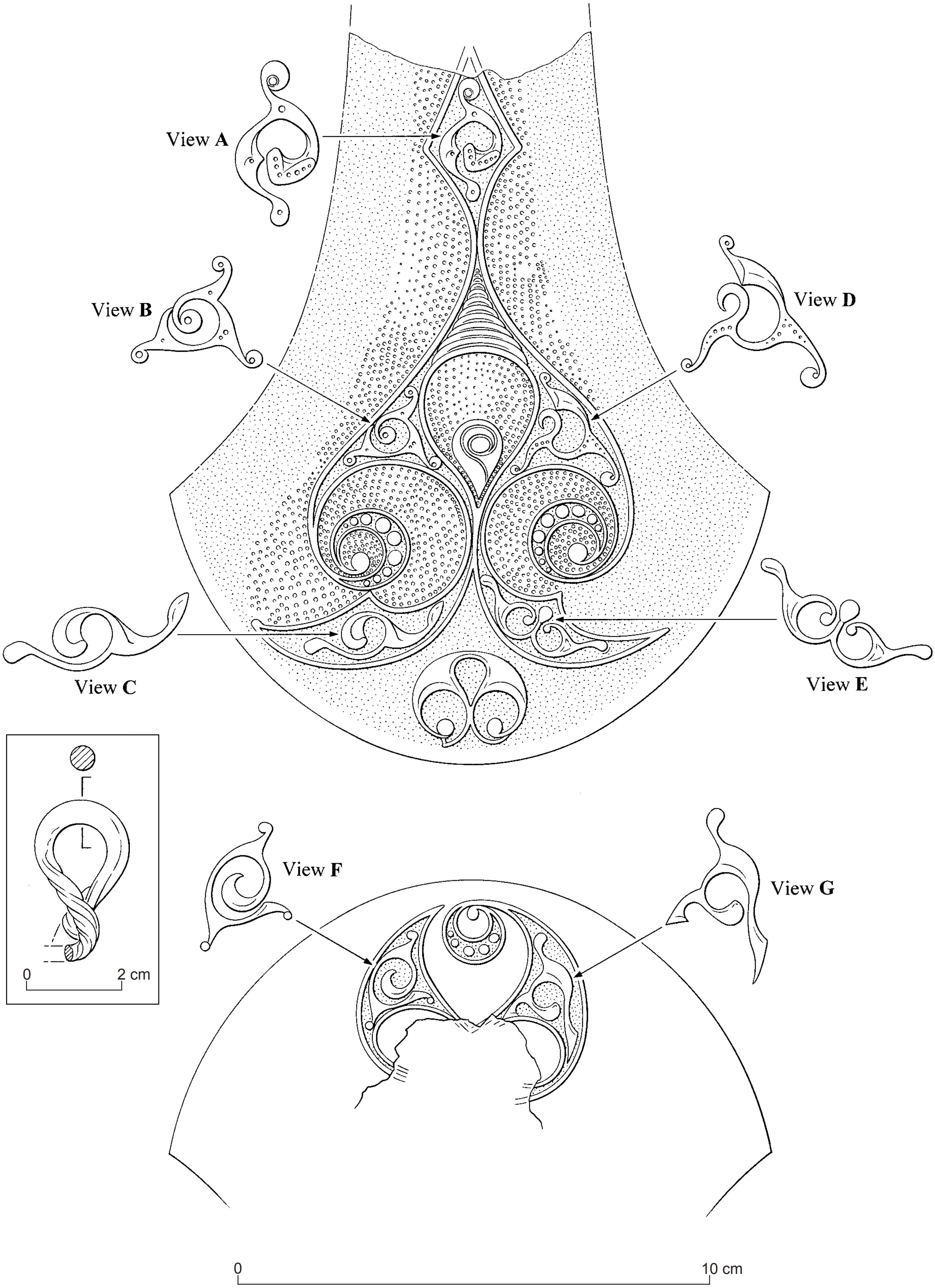
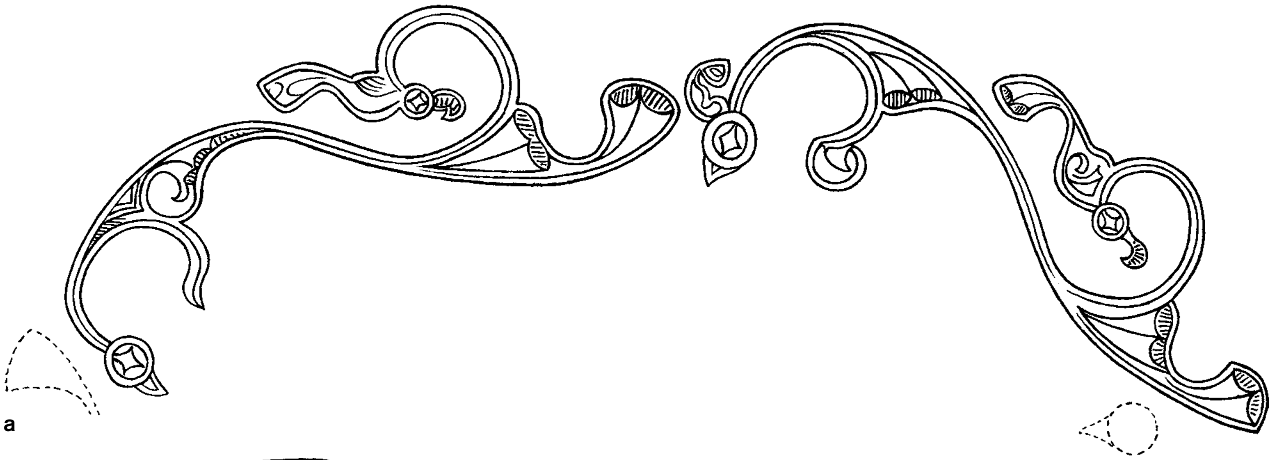


Figure 21.37 Illustration of torc F.43 (drawing by Jim Farrant)



a

b

Figure 21.38 Decoration on the Wandsworth shield boss (British Museum, 1858,1116.2). (A) is a two-dimensional reconstruction of the inscribed decoration on the raised central section of the boss. (B) shows the overall raised design, including a detail of inscribed motifs which have been sectioned off within discrete panels (drawings by Craig Williams)

exterior ornament is in the same style as the terminals of the torc it was linked to when discovered (E.1a, the so-called 'Great Torc'), with two opposing scrolls comprising hatched motifs linked by flowing raised lobe motifs. A line runs along the middle, separating the two scrolls. The raised decoration is bordered on both sides by an inscribed pattern of joining semi-circles set within two parallel lines. Correspondences for this type of decoration are discussed above in relation to Torc E.1a. But it is notable that the closest parallels for the ornamentation on these two objects are each other, particularly in the case of the circular button-like motif, with hatched background and the holes of the 'button' formed by raised knobs. Given their contextual association in addition to these similarities in design, the two items may have been made as a pair, intended to be worn together as a set.

Copper alloy helmet (F.445)

Owing to the condition of the metal, the decoration on the helmet (F.445; see **Figs 14.23–31**) is difficult to make out. It is clearer on the X-rays (**Fig. 21.41a–b**). One area of raised decoration (**Fig. 21.41a**) forms a reverse-S pattern parallel to an original straight edge. On the left, as it is seen in **Figure 21.41a**, is a keeled roundel with the motif delineated by raised lobes in the form of what MacGregor (1976, grammar of ornament) described as trumpet coils and Fox (1958, fig. 82) listed as sub-triangular, curvilinear forms. The circle within the keeled roundel is formed of a raised dome. The roundel is linked by a sweeping S pattern to a similar but slightly larger raised dome on the far right of the composition. A curving chased or inscribed line extends from the bottom of the central raised lobe up to the right-hand side of this dome forming a fin-shaped motif in the negative. The other decorated area (**Fig. 21.41b**) appears to be a patch to repair a defect in the metal sheet (whether applied at the time of manufacture or later is difficult to ascertain). The irregular-shaped patch also has so-called basket-hatching. (See the catalogue entry for F.445 in Chapter 14 for further discussion of these fragments and their relationship to the helmet.)

As is the case for much of the 'raised curvilinear' decoration at Snettisham, parallels for the raised decoration on the helmet can be seen on the shield boss and spine cover from South Cadbury, Somerset (Jope 2000, pl. 91a–d), the pony-cap from Torrs, Dumfries and Galloway (ibid., pls 100–1), the crescentic plaque from Llyn Cerrig Bach (**Fig. 21.11b**; Fox 1946, no. 75; 1958, fig. 18) and the linch-pins from a vehicle burial at Kirkburn (**Fig. 21.11d**; Stead 1996, 13). The plaque from Llyn Cerrig Bach in particular is

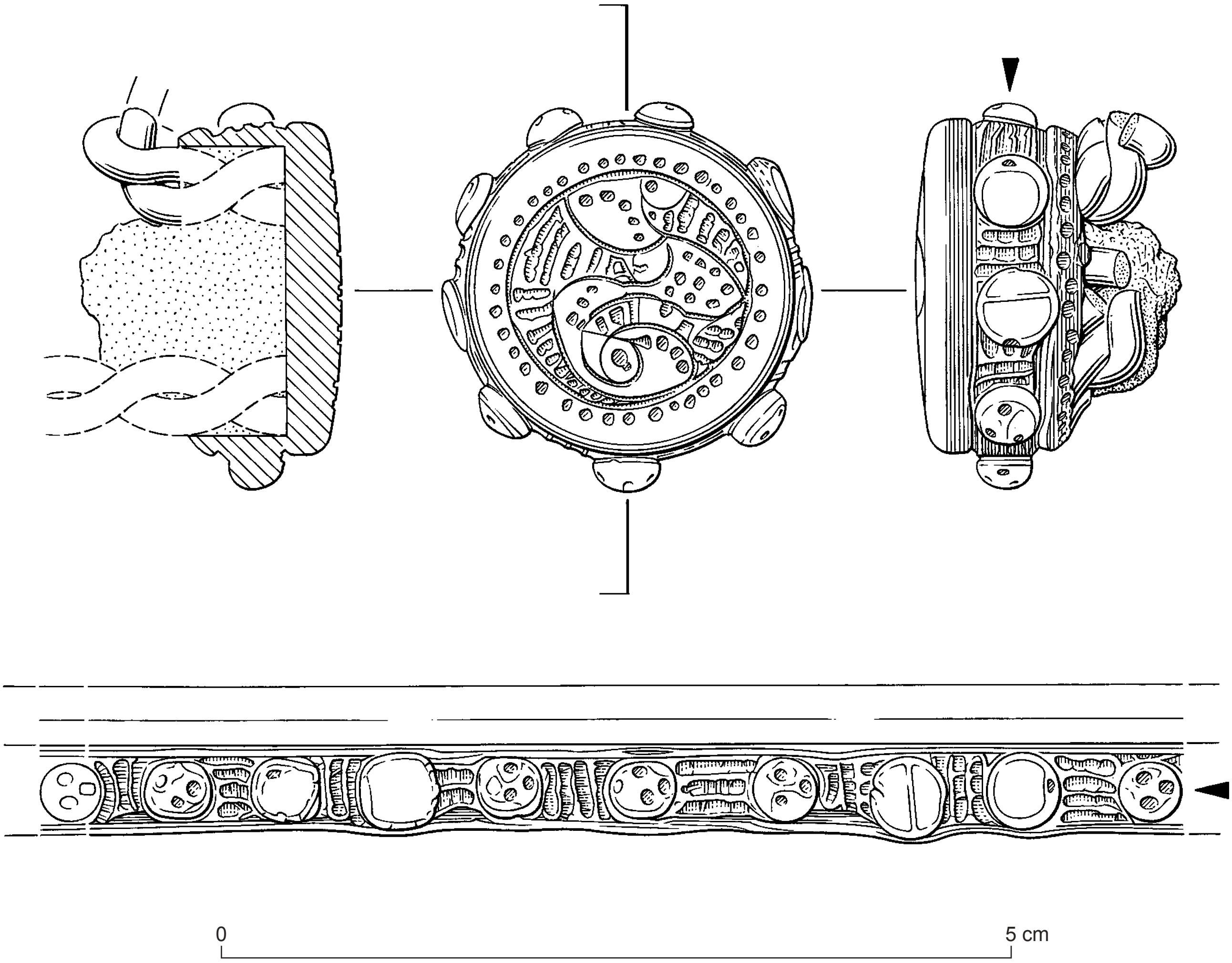
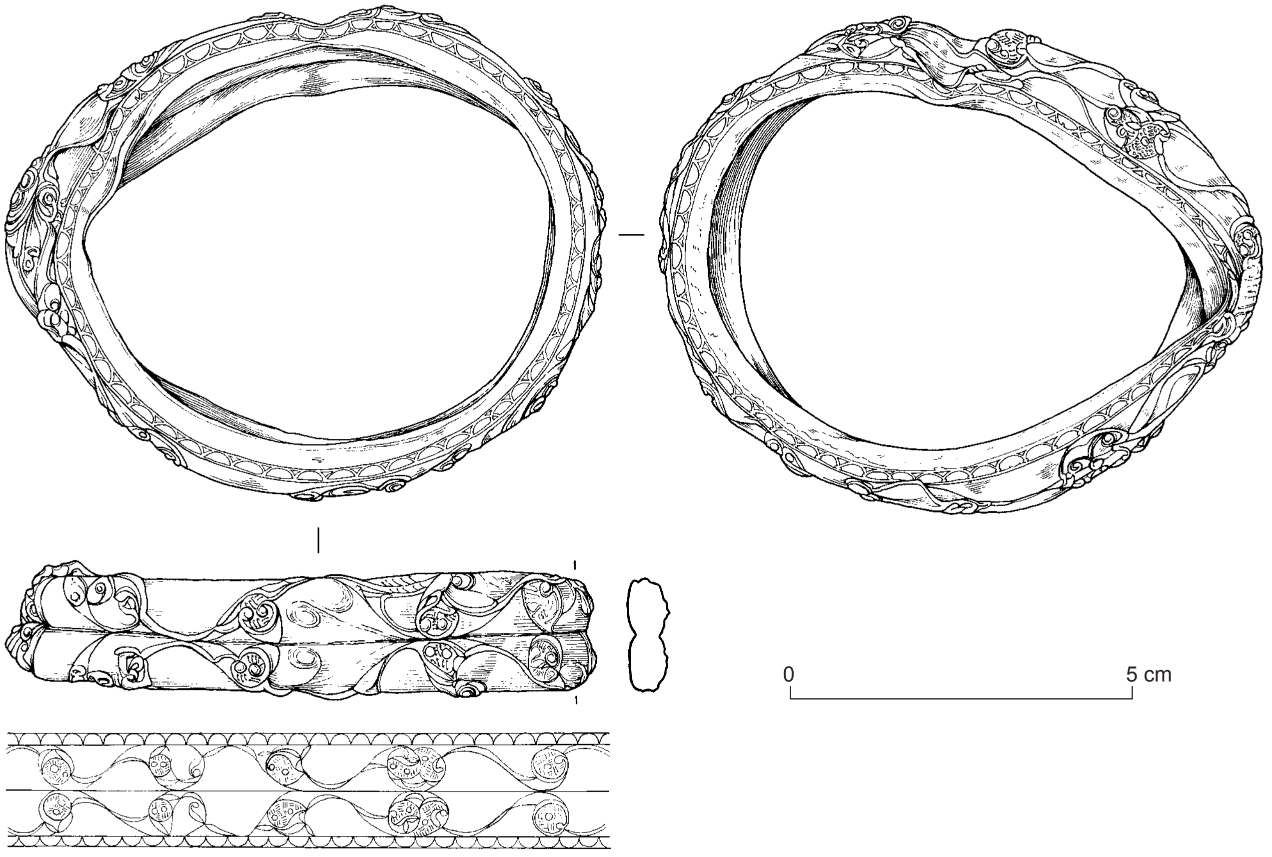
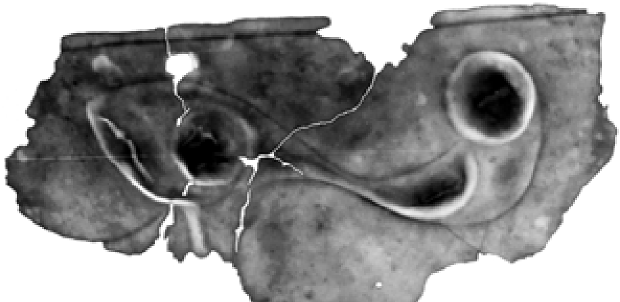


Figure 21.39 Illustration of torc F.106 (drawing by Jim Farrant)

Figure 21.40 Raised decoration on sheet gold bracelet E.1c (drawing by Craig Williams)





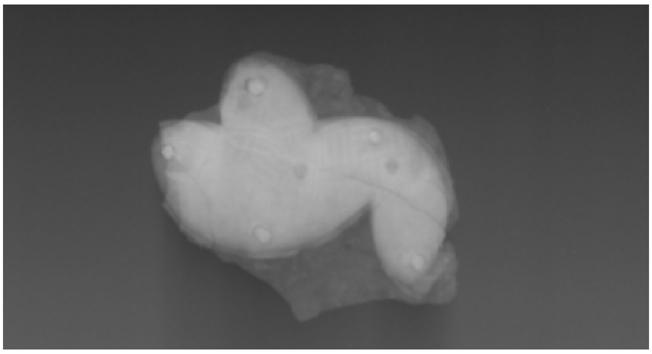


Figure 21.41a–b X-ray views of fragments from the copper alloy helmet, showing the decoration

identified by Stead (1996, 32–5) as a defining example of Style V Celtic art. The helmet decoration does not have the trumpet voids identified by Stead as a primary distinguishing feature of the style, but it does have the raised lobes and characteristic curvilinear pattern. In addition, the keeled-roundel shape which is prominent in the helmet plaque's decoration is found on many examples of Style V art. This motif has been much discussed and has been read as possibly depicting the head of a bird (Megaw and Megaw 2001, Ill. 338), perhaps even a puffin (Jope 2000, pls 184–5a and 248 a–f), whereas Spratling (2008, 195) suggested it could have depicted a horse's head, with the overall composition showing a horse on the move. Stead dated Style V decoration to the 2nd and 1st centuries BC (Stead 1996, 34). But owing to the general lack of contextual information for many of the artefacts decorated in Style V (other than mirrors (Joy 2010)), Macdonald (2007a; 2007b, 157–62) argued that this date range should be extended back to the 3rd century BC. This style of decoration can also be seen on artefacts found in 1st-century AD contexts, such as the mirrors from Portesham, Dorset, and Holcombe, Devon (Joy 2010, ch. 8).

In summary, on stylistic grounds, the decoration on the helmet is not out of place with the rest of the assemblage. But we cannot be more specific than restating the point that this type of decoration is found on objects dating from the 3rd century BC to the 1st century AD.

Terminals (S.253 and S.254)

Two cast copper alloy terminals (S.253, S.254; **Fig. 21.42**) each in the form of a bird's head, possibly a duck or a swan, were found to the east of the main focus of activity at Ken Hill (NHER 25249; Ch. 5, Trench SA15). The animal heads are sharply modelled in the round and were cast by the lost-wax method. Their precise function is unknown, but their conical shape suggests that they may be terminals from drinking horns. Drinking horns are rarely encountered in British Iron Age contexts. On the continent they are known from rich graves such as the nine iron examples from the 6th-century BC Hochdorf grave, SW Germany (Biel 1985), or the pair of gold drinking horns with rams' head terminals from the 5th-century BC Kleinaspergle barrow, SW Germany (Kimmig 1988). These items were probably used for alcoholic drinks. In the case of the Hochdorf burial, the drinking horns were possibly intended for the grave occupant and his guests (Fitzpatrick 2009). In Britain, the curved horns of the Torrs pony-cap were thought to have originally been drinking horn terminals (Piggott and Daniel 1951, 18), but this theory has now been questioned (Briggs 2014, 345). A number of fairly recent finds from Norfolk, reported to the Portable Antiquities Scheme, from Ashwellthorpe (PAS ID: NMS-003D82), Needham (PAS ID: SF-882904) (see also Davies 2011, 63–4) and Scarning (PAS ID: NMS-178AE0) could all derive from drinking horns, but this attribution is not certain. In these three cases, the terminals are bovine in form with two (Needham and Scarning) complete with protruding horns.

Mounts and terminals decorated with bovine heads are a reasonably common feature of the later Iron Age and Early Roman period (cf. Jope 2000, pls 166, 182–3; Ellis 2020) and are thought to have served as decoration on different types of vessel, appearing as escutcheons on buckets, and more rarely on tankard handles and cauldrons (Joy in Baldwin and Joy 2017, 61–2). Ducks and other water birds are less frequent. Probably best known are the ducks appearing to swim along a river of wine mounted on the spouts of the flagons from Basse-Yutz, NE France (Megaw and Megaw 1990), but these are much earlier than the Snettisham terminals. The handle of the copper alloy bowl from Keshcarrigan, County Leitrim, Ireland, has a cast handle in the almost cartoonish form of a duck's head. Jope (2000, pls 194–5) also illustrated a less ornate example of a duck-headed vessel handle from Somerset, County Galway, Ireland, alongside the Keshcarrigan bowl. In Britain, as discussed above, it has been argued that the keeled roundel could represent the head of a water bird. The raised decoration on the Wandsworth shield boss also defines two birds, possibly swans, flying around the rim (Joy 2015, fig. 31). One end of a small hooked copper alloy blade found near St Albans, Hertfordshire, could also represent the eyes and beak of a water bird (Stead 1996, fig. 4).

In sum, the decoration on the terminals is unusual and they can be dated no more closely than 300 BC–AD 50, possibly later. The discovery of other possible drinking horn terminals in the region, but with bovine decoration, could indicate a Norfolk tradition of their use. Such drinking horns would probably have been used to consume alcoholic drinks. Their deposition close to Ken Hill could be related to ceremonies or rituals accompanying depositional activity at the site.

Discussion

Owing to the extraordinary nature of the Snettisham deposits, it is difficult to assess whether there is a higher

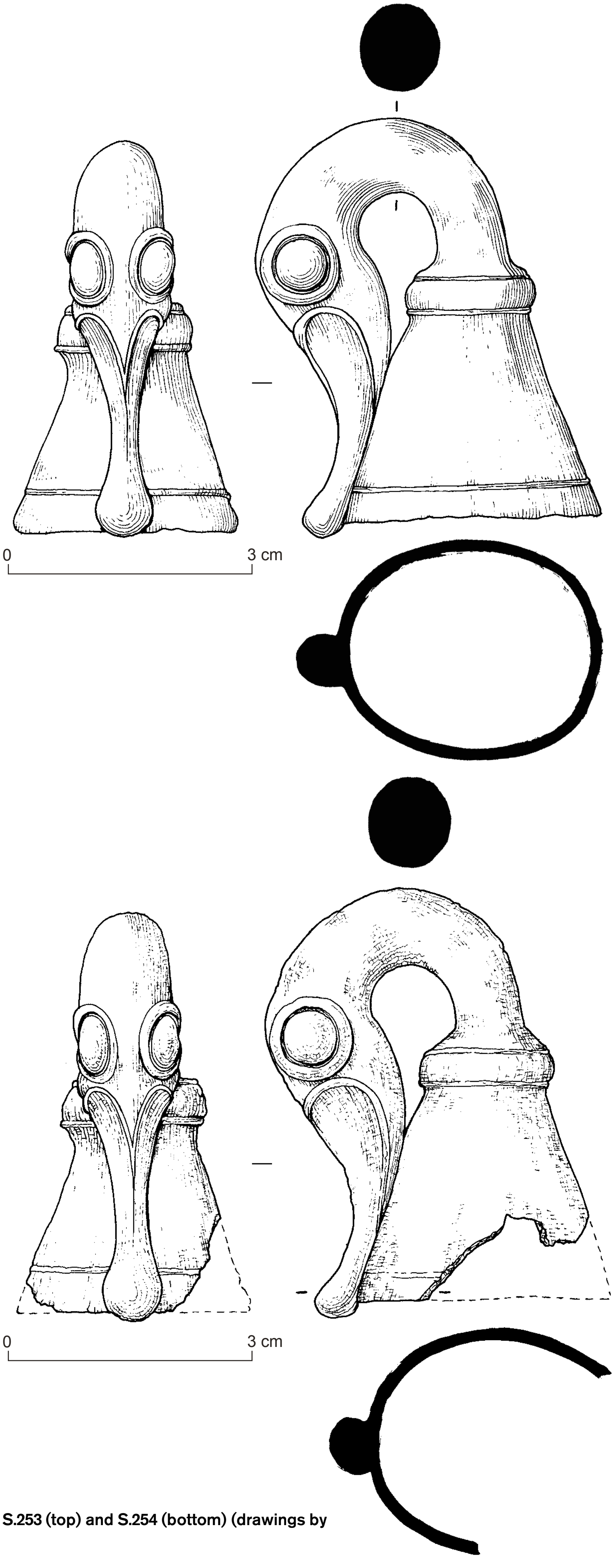


Figure 21.42 Terminals S.253 (top) and S.254 (bottom) (drawings by Craig Williams)

proportion of decorated versus undecorated artefacts than seen at other sites. As a broad comparison, four out of the six torcs from the Ipswich Hoard, Suffolk, are decorated, and one out of four objects in both hoards from near Stirling in Scotland and Leekfrith, Staffordshire. On these terms, the Snettisham hoards appear a little light on decoration, with only around 4% of objects being ornamented in this way, but there are many fragments present and also relatively plain objects such as ingots, and rings formed from flat metal strips. Also, we may not be comparing like with like, as the total assemblage is made up of many hoards. It is clear that some of the nested hoards which are most similar to torc hoards from elsewhere, such as E and L, contained a higher proportion of decorated artefacts (over 50%). Hoards with a higher proportion of fragmentary objects, most notably F, have fewer decorated items as a proportion of the total number of artefacts (although it should be noted that Hoard F contained at least 20 decorated objects, 12 with curvilinear designs: a large number compared to most known deposits from Britain containing Celtic art).

The art on the objects from Snettisham is more varied than is sometimes apparent when flicking through Celtic art compendiums, which tend to focus on the raised curvilinear ornament of the 'Great Torc' and its accompanying bracelet. Looking at the overall proportion of decorated torcs, roughly 40% of the ornamented examples are actually tubular torcs, with around 60% being multi-strand torcs with wire neck-rings (**Fig. 21.43**). Decoration appears to have been more common on particular types of multi-strand torc (**Fig. 21.44**), with buffer and torus terminal torcs comprising around 80% of the corpus of decorated multi-strand torcs, despite representing only around 30% of multi-strand torcs with an identifiable terminal type (see Ch. 13, **Fig. 13.4**). A possible explanation is that these terminal forms provide the best 'canvass' for decoration, over ring and loop terminals.

It is interesting to note the relatively high number of artefacts from Snettisham decorated with non-curvilinear motifs. In Garrow's broad-ranging survey (2008, fig. 2.3), the proportion of, as he termed it, 'swirly' versus 'non-swirly' decoration, on objects he categorised as torcs or collars was roughly 40:60. It must be stressed that within this category other object types such as beaded torcs and Wraxall-type collars were also included. The ratio for the Snettisham torcs is probably 80:20 in favour of curvilinear decoration, but non-curvilinear decoration still forms a reasonably high proportion. Those which are ornamented by exclusively non-curvilinear designs tend to be narrower-bodied tubular torcs. Perhaps there were special design rules or conventions which dictated the type of decoration appropriate for such objects, or alternatively they may have been manufactured by different producers. Some artefacts, especially broader-bodied Type 5 and Type 6 tubular torcs, are also ornamented by both curvilinear and non-curvilinear motifs, indicating that there may have been crossover of producers, or perhaps that different rules were applied to the decoration of these objects compared to multi-strand torcs.

In terms of the curvilinear decoration, most of the decorated artefacts from Snettisham are ornamented in a manner conforming to Stead's Style V. The raised peltas and berries and (in many instances) hatching which occur on torcs are all distinctive features of art in southern Britain dating to the last three centuries BC and the 1st century AD. Such designs also adorn other types of artefact, including mirrors, sword scabbards, and horse trappings.

Like much of this art, it has also been possible to group artefacts further into categories (Stead 1996, 34–5). In this instance it is suggested that a distinction could be made between 'raised curvilinear' and 'inscribed curvilinear' designs. Raised curvilinear decoration occurs most often on the terminals and collars of multi-strand torcs. Sometimes motifs in the negative, defined by lobes in relief, are hatched, as is the case on the so-called 'Great Torc'. As has already been highlighted, this is the style most often encountered in Celtic art compendiums. In part this is likely due to the popularity of the 'Great Torc', but also because gold alloy torcs from elsewhere are decorated in a similar style (e.g. the Newark, Sedgeford, and Ipswich torcs and the terminals from Netherurd, Clevedon, Hengistbury Head and North Creake, see Gazetteer in Ch. 22). Inscribed curvilinear designs, often defining positive and negative motifs through selective hatching, are also found on torc terminals, especially those with multi-strand neck-rings. As both these styles of decoration overlap chronologically and geographically, it is not possible to draw many other distinctions between raised and inscribed ornament. For example, when designs are extrapolated in two dimensions, the outlines used to form both raised and inscribed patterns are the same, and in at least one case the two styles are found together on one object (F.106).

Outside of the main decorative scheme is anthropomorphic and zoomorphic art. Only one torc (S.13) is clearly anthropomorphic, though torc L.19a with its enigmatic face can be fitted into a scarce but widespread tradition of 'hidden' faces in Celtic art (cf. Jacobsthal 1969 [1944], ch. 1). Other examples include a face encompassed within a curvilinear design on a copper alloy mount on an iron helmet from Umbria (*ibid.*, no. 144), a number of linch-pin heads from Europe (*ibid.*, nos 161–3), as well as other torcs, such as the copper alloy example from Nancy, France (*ibid.*, no. 208). In all of these cases, the head alone is depicted and it is not so much 'hidden', more 'hidden in plain sight'. Similarly, there is a tradition of depicting animal forms on torcs, such as the beasts on one of the torcs from Frasnes and the huge silver torc from Trichtingen, south-west Germany, with its bull's head terminals. In terms of numbers of objects, the traces of anthropomorphic and zoomorphic decoration within the Snettisham hoards are probably present in the same proportions as they occur elsewhere in Britain.

As shown in **Table 21.2**, Hoards A, F and L contain objects decorated with both curvilinear and non-curvilinear decoration. This sometimes occurs on the same object. Hoards F and L also contain objects decorated in different Celtic art styles. The decoration on a number of torcs, such as F.43, crosses Stead's Celtic art styles. F.31a is another good example of this. Some motifs can clearly be assigned to Style V (which Stead (1996, 35) originally argued was a product of the 2nd and 1st centuries BC), whereas others resemble the Vegetal Style (Style II), commonly thought to date to the 4th century BC. Interestingly, the decoration on non-hoard finds

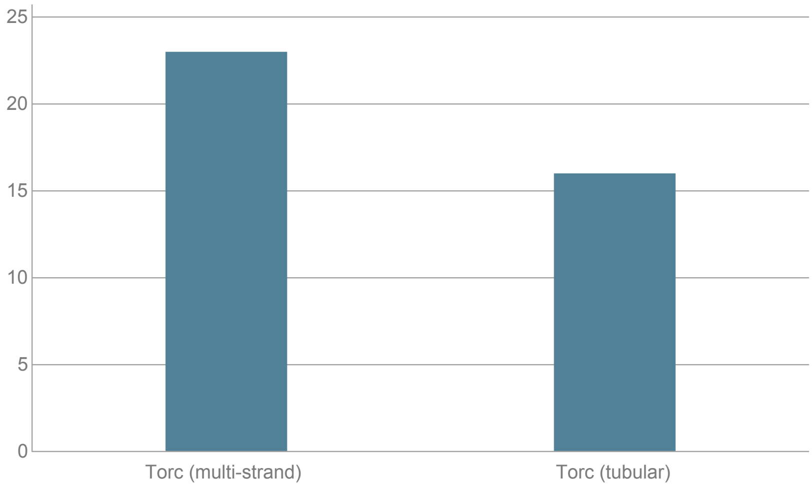


Figure 21.43 Numbers of decorated torcs by type of neck-ring (n=39)

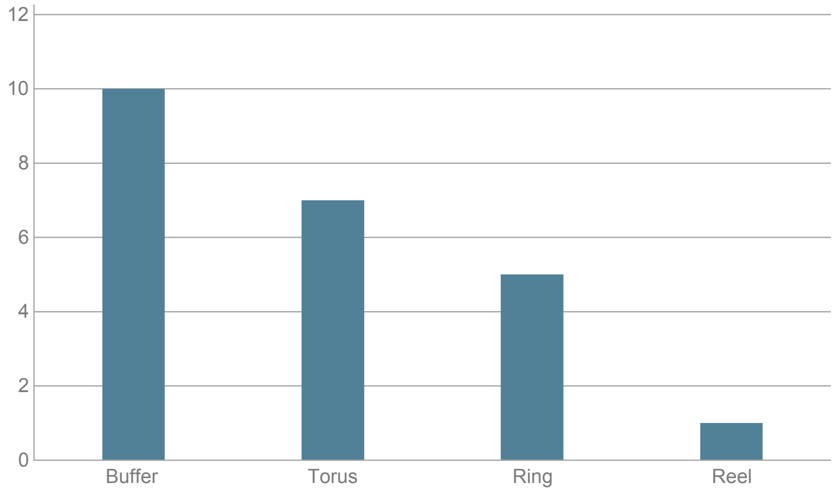


Figure 21.44 Number of decorated multi-strand torcs by terminal type (n=23)

is quite varied (**Table 21.3**) with anthropomorphic and zoomorphic decoration in addition to curvilinear and non-curvilinear. The number of artefacts is small so it is difficult to tell if this is a 'real' phenomenon, particularly as it includes other types of artefacts, not just torcs, such as terminals, which may conform to different decoration rules and traditions.

As was suggested in the introduction, the chronological significance of these style categories, or stages as Stead termed them, in Britain has been called into question (Macdonald 2007a; Garrow *et al.* 2009; Garrow and Gosden 2012). Macdonald (2007a, 332) identified individual objects decorated in different styles, such as the terminal of the torc from Clevedon (on which the face is decorated with Style V art whereas the collar is decorated in Style II or possibly even Style I art). A growing number of artefacts decorated in Style V art from well-excavated contexts, such as the artefacts from the Deal grave (Parfitt 1995), also show that the style can be pushed back in date to at least the 3rd century BC (Macdonald 2007a, 332–3). Taking account of these findings, Stead modified his categorisation and concluded that Styles II, III, IV and V overlapped in the 3rd century BC (Stead 2009, 331). These assertions support the notion put forward by Garrow and Gosden (2012, 80) that Celtic art styles were accumulative rather than successive in character (see also Garrow *et al.* 2009). Rather than a wholesale replacement, new styles were added to the available decorative repertoire. Garrow and Gosden (2012, 80) described the lifecycle of motifs as a battleship curve with a long tail. Older styles were referenced in later works, meaning that the art became more complicated over time. Perhaps we can see this with the design on torc F.31a, with its curvilinear Style V design ending in Style II (or so-called Vegetal Style) tendrils. This is supported by radiocarbon dating of organic components of, and material associated with, Celtic art objects (Garrow *et al.* 2009; Hamilton *et al.* 2015). Garrow *et al.* (2009) conducted a wide-ranging survey, obtaining multiple dates for decorated metalwork from Britain. Bayesian modelling of these dates indicated that Styles I to V were in use in Britain between the 4th and 1st centuries BC, but it was particularly hard to separate Styles III to V chronologically. Using the term 'Stage' rather than 'Style', Garrow *et al.* concluded '… decorated metalwork in Britain between the 4th and early 1st centuries BC did not follow a recognisable progression of styles. While Stage II probably did first appear at an earlier date than Stage III, for example, and Stage IV seems to have appeared earlier than Stage V, they were not strictly successive – i.e. Stage IV did not replace Stage III and so on. Rather, we would suggest that there was a gradual accumulation of motifs, and while some were earlier and others later, both could be combined on later pieces' (Garrow *et al.* 2009). The results of a second Bayesian statistical analysis of radiocarbon dates conducted by Hamilton *et al.* (2015) produced similar results,

Hoard	Curvilinear decoration	Non-curvilinear decoration	Stead's 'Style'	Notes
A	Y	Y	V	Raised curvilinear, non-curvilinear, punch-marks
E	Y	-	V	Raised curvilinear
F	Y	Y	II, III, IV, V	Raised curvilinear, non-curvilinear, inscribed curvilinear, Plastic Style
H	-	Y	-	Non-curvilinear
K	-	Y	-	Non-curvilinear
L	Y	Y	III, V	Raised curvilinear, non-curvilinear, inscribed curvilinear, Plastic Style

Table 21.2 Different decorative styles in each hoard

Cat. no.	Curvilinear decoration	Non-curvilinear decoration	Stead's 'Style'	Notes
S.13	Y	-	?III, ?V	Anthropomorphic
S.19	Y	-	V	Inscribed curvilinear
S.48	Y	-	V	Raised curvilinear
S.83	Y	-	?III	Zoomorphic
S.253	Y	-	?IV	Zoomorphic
S.254	Y	-	?IV	Zoomorphic

Table 21.3 Decorative styles on non-hoard finds

concluding that Style V was in use possibly as early as 380–320 cal BC (13% probability), but more probably from 275–200 cal BC (82 % probability), and ending sometime in the 2nd century AD (Hamilton *et al.* 2015, 652) and therefore overlapped with other styles.

As we have seen, using stylistic analysis as a means of dating Celtic art is fraught with problems, especially with so many styles seemingly coalescing in the 3rd century BC. But in some instances, such as the 'Grotesque Torc' (L.19a), if we combine evidence from use wear analysis with the use of a style which is otherwise rare in Britain, it is possible to infer that it was probably made some time in the 3rd century BC, when the Plastic Style was most prevalent on the continent, and that therefore the torc must have been old by the time it was deposited (Ch. 20; Joy 2016). With other examples which include a mixture of styles without evidence for wear (such as F.31a or F.43), dating is more difficult. They could have been made in the 3rd, 2nd or 1st centuries BC, some possibly even the 1st century AD if they are assessed purely on stylistic grounds.

In sum, the decorated artefacts from Snettisham are extremely varied. Given the different styles employed, and by correlating stylistic dating with radiocarbon dating and evidence for wear and repair (see Ch. 20), it is likely that the objects span two to three centuries. The decorated objects may be representative of those in circulation at the time of deposition, or could be a specially selected sample. Potentially, the majority of artefacts were manufactured within two generations or so of their dates of deposition (most likely concentrated in the mid-1st century BC, see Chs 8, 20, 22–3), but a small proportion were far older. These older artefacts provide clues as to how previous generations of torcs may have looked.

What does art on torcs do?

Many debates on torc decoration in particular have focused on stylistic dating and fitting patterns into wider stylistic schemes. The great majority of this chapter can be viewed as a further contribution, influenced by works such as Bradley 2009; Chittock 2014, 314; Gosden and Hill 2008, 9; Joy 2011, 206. In this last section, we ask a different question: 'What did the art do?' focusing on torcs. In order to answer this question, we first consider the character of the decoration and its position on the objects before then thinking through its potential effects on the wearer and viewer.

First, as we have seen, the decoration on torcs varies greatly but (with the exception of the punch-marks seen on some of the tubular torcs) decoration most often occurs on the most visible areas of the object: the terminals and collars and, occasionally, the back of the neck-ring. We can conclude from this that the decoration was intended to be seen when torcs were worn. Second, much of the decoration was outlined through texture, with raised motifs and hatching, as well as different forms of punching and stippling. This bestows the decoration with a number of properties which might affect how it works on other actors. For example, most of the decorated torcs are made of gold/silver alloy and would therefore have had a shiny surface. Raised and textured surfaces would have acted to break up light and reflections, making the decoration stand out more clearly, especially from a distance. Another outcome of a textured surface is that it makes an object more tactile. It is difficult to quantify, but intense wear on the decoration of some torc terminals (seen for example on L.10a and L.20a) is unlikely to be purely the result of normal use, and may have been caused by torc wearers touching the terminals, tracing their hatched surfaces. Here, we can see how decoration afforded interaction at different distances and removes of access. Those with the right and access to handle torcs could examine the decoration in detail, tracing its often sinuous pathways with their fingertips. People who only encountered the objects from a distance, perhaps as they were worn on a special occasion, would have seen the decoration in glimpses as the textured surfaces glinted in the sunlight or flickering firelight.

The complexity of patterns could also have affected the viewer. Looking at examples of Celtic art from elsewhere, and influenced by the work of the social anthropologist Alfred Gell (1992; 1998), some researchers have suggested that complicated designs could have acted like a kind of mind trap, drawing the viewer in by leading the eye in different directions and holding the viewer's attention (Giles 2008, 66; Joy 2011, 206). If we think of the example of the human figure depicted on torc S.13, or the more enigmatic faces suggested on L.19a, they are not so much hidden, but rather concealed or obscurred despite being in full view. The human brain is adept at recognising specific arrangements of patterns or marks (Malafouris 2013, ch. 8), and the faces on these torcs would have grabbed the viewer's attention. A casual glance may have revealed a possible human figure, requiring a second look and turning a fleeting glance into a closer engagement. In terms of the meanings of certain motifs (such as whether keeled roundels represent animals or birds), this is unfortunately now unknowable.

Also inspired by the work of Gell, some Celtic art has been interpreted as a kind of 'technology of enchantment'. According to this model, artefacts are seen to be so skilfully made that viewers are awed by their complexity. The skill of their manufacture appears impossible to explain, except by some form of divine or magical intervention (Giles 2008, 60; Macdonald 2007a, 336). Certainly, as is exemplified by discussion in Chapter 17, the exact skills employed to manufacture some of the torcs are difficult to fathom even today.

In sum, decoration on torcs was not only there to make them look nice. It acted to enhance particular effects and characteristics as the object and the torc wearer moved and interacted with one another and others. Raised surfaces and varying textures made decoration visible from a distance, but the full complexity of designs was only visible to those with intimate access, creating different arenas of interaction and knowledge.

A final possible means by which the decoration on torcs could be seen to act is explored in more detail elsewhere (Joy 2019b), but it is worth restating some of these ideas here. Focusing on the retention of relict motifs in the various torc designs discussed above, it is argued that the incorporation of these designs was deliberate and not accidental and that these motifs would have stood out just as obviously to an Iron Age audience as they do to a specialist in Celtic art. One reason why these motifs might have been retained is as a means of manifesting relations across time. The discovery of artefacts from Snettisham such as torc F.43 decorated in different styles has significance beyond Macdonald's (2007a, 332–3) observation that the presence of different styles on the same artefact undermines the security of stylistic dating. The complicated mixing of different decorative styles on the same object provides a powerful new interpretative tool to interrogate Celtic art from Britain: the relationships between styles and motifs, new and old, manifested by their presence on the same object. Art styles were not simply cast aside, following the latest fashion. Knowledge of past styles was retained (perhaps in part through the continuing circulation of long-lived artefacts) and elements of old styles were incorporated into new designs. These 'retentions' would have been readily evident to makers and consumers and this deployment of earlier styles alongside newer styles created connections between the past, present and future. The inclusion of already old objects decorated in different styles, such as the Grotesque Torc in Hoard L, extends this notion further to stylistic relationships between different objects selected for deposition in the same context.

Chapter 22
Torcs in Iron Age Britain

Jody Joy and Julia Farley

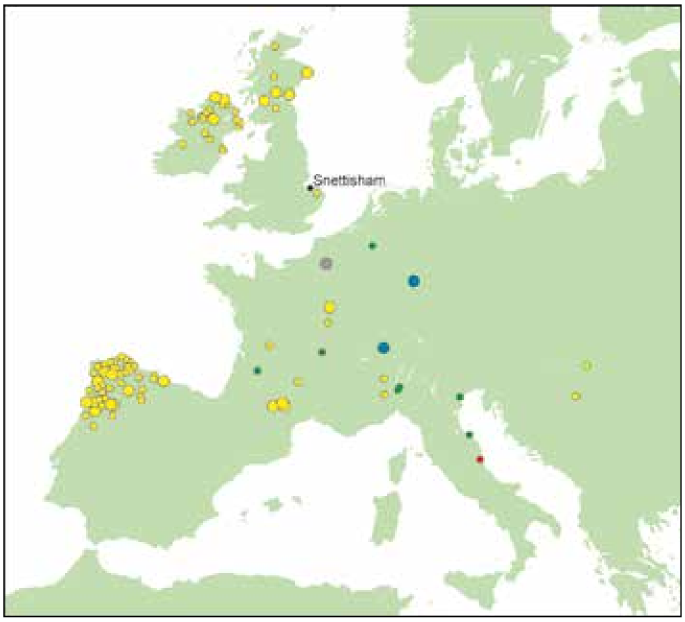
The purpose of the next two chapters is to bring together the evidence compiled in this volume to assess the significance of Snettisham with a focus on torcs and hoards. As the most commonly represented object type at Snettisham, and perhaps the best studied group of Iron Age objects, torcs warrant an in-depth analysis. This chapter considers how they were worn in life, who might have worn them and what effects they had on the human body. It is concluded that torcs played an important role in negotiations of identity and social standing. The following chapter (Ch. 23) examines what hoards do. It is argued that by repeatedly depositing artefacts at Snettisham, but with subtle differences in the composition and make-up of the hoards, social change was enacted in inferences, facilitating the replacement of a 'world of torcs' with a 'world of coins' (Gosden 2013).

Torcs from Britain and beyond

What is a torc?

The word 'torc' or 'torque' comes from the Latin *torques*, ultimately from torquere, meaning 'to twist', and is defined by the *Oxford English Dictionary* (*OED*) as: 'a collar, necklace, bracelet, or similar ornament, consisting of a narrow band or strip, usually of precious metal, worn especially by the ancient Gauls and Britons' (Anon. 1973, 2330). Torc is used here to describe all ornaments formed of a neck-ring with prominent terminals (cf. Eluère 1987, 22) and is not restricted to those formed of twisted wires. Iron Age torcs may be made of precious metals, copper alloy or iron and date from the 6th century BC to the 1st century AD. They are found across a wide area from the Czech Republic, to Germany and France, and as far west as Ireland, Britain and the Iberian Peninsula (**Fig. 22.1**). There is significant regional variation and torc terminals can often be highly decorative. This decoration has attracted much attention and debate in terms of seeking stylistic parallels (e.g. Stead 2009).

It is of note that even in the *OED* definition, torcs are specifically related to the Gauls and Britons: ancient peoples and identities. This association can be attributed to the influence of classical authors on modern-day understandings of Iron Age society as they described some of the people of north-western Europe wearing torcs. For example, writing about the battle of Telamon in 225 BC, the Greek historian Polybius described the warriors facing the Roman troops: 'Very terrifying too were the gestures of the naked warriors in front, all in the prime of life and finely built men, and all in the leading companies richly adorned with gold torcs and armlets' (quoted in Cunliffe 1995, 87). Similarly, Dio Cassius described Boudica as wearing a golden torc: 'She had a mass of very fair hair which she grew down to her hips and she wore a great gold torque and a multi-coloured tunic folded round her, over which was a thick cloak fastened with a brooch. This is how she always dressed' (Dio Cassius, *Hist. rom.* 62.2, quoted in Aldhouse-Green 2006, 130–1). These associations are of relevance here because they have influenced past interpretations of British torcs; for example, describing the torcs from Ipswich, Brailsford suggested they '… obviously belonged to chieftains of the tribal nobility, if they belonged to individuals at all. Dio Cassius (LXII) recorded that Boudicca, queen of the Iceni, habitually wore



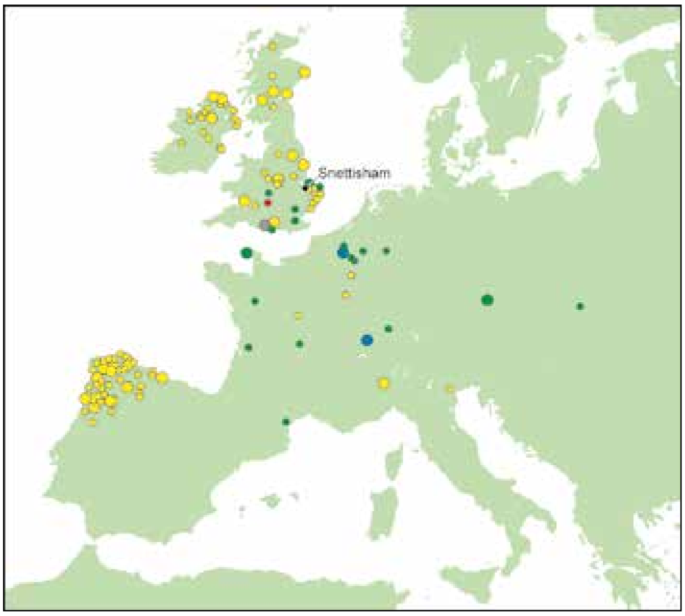


Figure 22.1 Gold Iron Age torc finds from Europe, grouped by period. Ribbon torcs are shown in both the latter two chronological stages, as they cannot be clearly assigned to one or other. Snettisham is also shown in both latter maps, as it is possible that some of the torc hoards (those not containing coins, such as A, D, G, H, K and L) could have been deposited before 150 BC. Sources for the continental finds include Hautenauve (2005) and Fitzpatrick (2005)

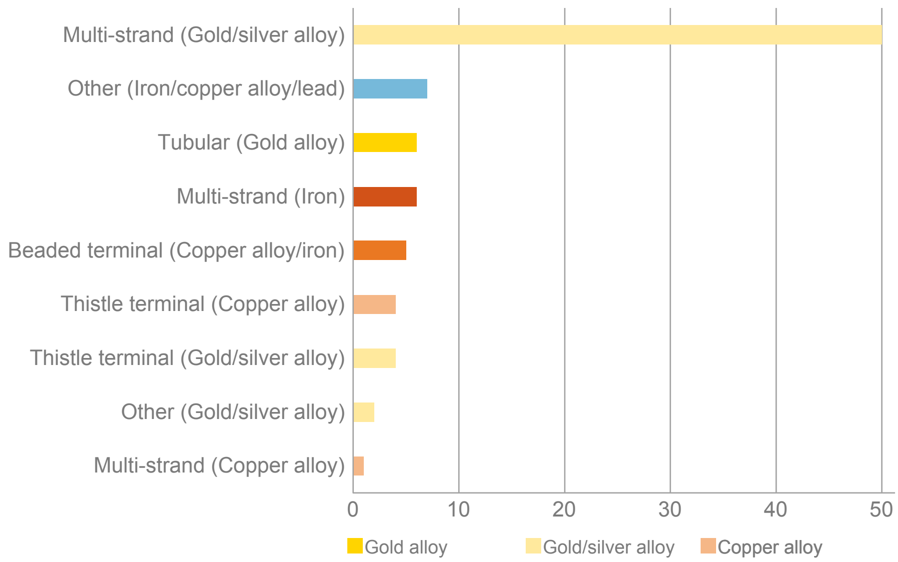


Figure 22.2 Proportions of torc types from other sites across Britain (n= 85; see Table 22.2), by type and material. This excludes the two torcs of unknown type, and the two ribbon torcs from the Stirling Hoard as well as later copper alloy torcs (beaded, Wraxall and Baldock types, see below)

a large golden necklace which was no doubt a torc' (Brailsford and Stapley 1972, 227). The idea of a link to hierarchy and even nobility will be discussed further below, but it should be questioned exactly how representative these classical texts were intended to be, or whether their authors were more concerned with the expectations of their intended audience, for whom torcs were clearly tied to the identity of the peoples, or barbarians, who lived north of the Alps (Hutton 1991; 2007, 3–6; Wells 2001, 82). This notion has perhaps also proved attractive because in Western society excessive adornment is often viewed as superfluous, unimportant and vain (Entwistle 2000, 53), and perhaps this is also one of the reasons why the trope of the 'vain Celt' continues to be propagated (see e.g. Cunliffe 1995).

Beyond Snettisham: other torcs and neck-rings from Britain and their European context

Before questioning the possible importance of the Snettisham torcs, it is first necessary to set them in their wider context. Torcs show a great variety, especially considering that they are not common objects. Hautenauve (2005) only recorded 276 complete gold alloy torcs from continental Europe (Garrow and Gosden 2012, 134–8). Many more copper alloy torcs are known, being common finds in grave assemblages in certain regions, particularly in France (cf. Stead *et al.* 2006).

Figure 22.1 shows the distribution of Middle to Late Iron Age gold alloy torcs across Europe. Early finds are rare and predominantly appear as grave goods, such as the beautifully decorated examples from Reinheim (Echt 1999) and Waldalgesheim, or as single finds, though small hoards are known including the wonderful torcs and bracelets from Erstfeld, Switzerland (Guggisberg 2000). Later torcs are found in larger hoards and (especially after *c.* 150 BC) often appear in mixed hoards including both torcs and coins (Fitzpatrick 2005).

The significance and meaning of these artefacts clearly differed over time, and also regionally. Depending on the region, torcs are found in association with both sexes and different age groups. For example, in eastern France torcs are found primarily with middle-aged women, but are also found in the graves of children and older individuals (Pope and Ralston 2011, 380). In western Germany, gold torcs from the 5th and 4th centuries BC are found in both female (Besseringen, Reinheim, Waldalgesheim) and male (Glauberg) graves. But these German examples are stylistically distinct, with complicated Celtic art decoration of hidden faces and beasts on the examples from the female graves and a simple three-lobed pendant form in the case of the male warrior grave at Glauberg. Thus, it is likely that more complex rules governed these elements of dress than simply a binary gender distinction as to whether torcs were (or were not) appropriate in each case.

Later, from the 1st century AD onwards, the form of the torc was also adapted by the Romans where it took on military associations (Maxfield 1981). Roman torcs or *maniakions* are thought to have been introduced into the Roman army from Gaul. Over time they became progressively more important, worn on armour (over the chest, rather than at the neck) as military decorations and later as a mark of office (Goldberg 2015, 165–6). They were also awarded for bravery (Mráv 2015, 287).

In terms of discoveries made from elsewhere in Britain, discussion here is mainly limited to the main torc types found at Snettisham (multi-strand torcs in copper alloys and precious metals, and gold alloy tubular torcs). **Table 22.1** provides a summary, with full details outlined in the Gazetteer which appears at the end of this chapter. In addition to multi-strand and tubular torcs, unusual torc finds and comparable bracelets are included, as well as thistle-terminal and beaded-terminal rod torcs in both precious metal and copper alloys (although only one possible fragment of a copper alloy rod torc has been recovered from Snettisham, S.83, and its terminal form is unknown). The ring from Knaresborough (PAS ID BM-CDF17E) is not included here given its current form, though Machling and Williamson (2024) have argued that it might have been made from a fragment of an Iron Age torus torc.

Distinct torc traditions that are discussed in detail elsewhere are omitted from **Table 22.1** and the Gazetteer. Gold (and, in rare cases, silver) ribbon torcs are concentrated in Ireland and Scotland, probably dating from 300–50 BC (Warner 2004; Eogan 1983; Hunter 2018). With the exception of the hoard from near Stirling, which also

No.	Site/location	County	Torc types	No. torcs	Material	Deposit type	Coins?	Frag.?
1	Stirling area	Central Scotland	MS; OTH	4	Gold/silver alloy	Hoard	N	Y
2	Hengistbury Head	Dorset	MS; MS (B)	3	Gold/silver alloy	?Hoard; ?Multiple deposits	Y	Y
3	Maiden Castle	Dorset	BT	1	Copper alloy	Single find	N	Y
4	Spetisbury	Dorset	MS	1	Iron	Single find	N	N
5	Dungyle Camp	Dumfries & Galloway	OTH	1	Iron/copper alloy	Single find	N	N
6	Colchester (i)	Essex	BT	1	Copper alloy	Single find	N	Y
7	Colchester (ii)	Essex	?TUB	1	Gold/silver alloy	Single find	N	Y
8	West Tilbury, Thurrock	Essex	TT	1	Gold/silver alloy	Single find	N	Y
9	Merthyr Mawr	Glamorgan	MS	1	Gold/silver alloy	Single find	N	Y
10	Walbrook	Greater London	TT	1	Copper alloy	?Watery deposit	N	N
11	Danebury	Hampshire	MS	1	Iron	Single find	N	N
12	Whitchurch	Hampshire	MS	1	Silver alloy	Hoard	N	Y
13	Essendon	Hertfordshire	TUB	1	Gold/silver alloy	?Multiple deposits	Y	N
14	Wendy	Hertfordshire	OTH	1	Copper alloy	Single find	N	Y
15	Auldearn	Highland	MS	1	Copper alloy	Hoard	N	N
16	Aylesford (River Medway)	Kent	TT	1	Copper alloy	?Watery deposit	N	N
17	Shepherdswell with Coldred	Kent	MS	1	Gold/silver alloy	Single find	N	Y
18	Upchurch	Kent	OTH; BT	2	Iron/copper alloy	Hoard	Y	Y
19	Burnley	Lancashire	MS	1	Gold/silver alloy	Single find	N	N
20	Caistor	Lincolnshire	TT	1	Gold/silver alloy	Single find	N	Y
21	Bawsey	Norfolk	MS	*c.* 4	Gold/silver alloy	?Hoard/ ?Multiple deposits	N	Y
22	Blackborough End	Norfolk	MS	1	Gold/silver alloy	Single find	N	N
23	Diss (near)	Norfolk	MS	1	Gold/silver alloy	Single find	N	N
24	Forncett	Norfolk	MS	1	Gold/silver alloy	Single find	N	Y
25	Gayton	Norfolk	MS	1	Gold/silver alloy	Single find	N	Y
26	North Creake	Norfolk	MS	1	Gold/silver alloy	Single find	N	Y
27	Norwich	Norfolk	TUB	1	Gold/silver alloy	Single find	N	Y
28	Sedgeford	Norfolk	MS	1	Gold/silver alloy	Single find	N	N
29	South-west Norfolk	Norfolk	MS	1	Gold/silver alloy	Single find	N	N
30	Weybourne	Norfolk	?TUB	1	Gold/silver alloy	Hoard	Y	Y
31	Ulceby (*some finds lost)	North Lincolnshire	MS	3	Gold/silver alloy	Hoard	N	N
32	Fremington Hagg	North Yorkshire	BT	1	Copper alloy	?Hoard	N	Y
33	Towton	North Yorkshire	MS (B)	2	Gold/silver alloy	?Hoard	?N	N
34	Great Houghton	Northamptonshire	OTH	1	Lead alloy	Burial	N	N
35	Newark	Nottinghamshire	MS	1	Gold/silver alloy	Single find	N	N
36	Ellesmere	Shropshire	MS	1	Gold/silver alloy	Single find	N	Y
37	Telford	Shropshire	MS	1	Gold/silver alloy	Single find	N	Y
38	Cadbury Castle	Somerset	OTH	3	Iron	?Single finds	N	Y
39	Camerton	Somerset	MS	1	Iron	Single find	N	N
40	Clevedon	Somerset	MS	1	Gold/silver alloy	Single find	N	Y
41	Ham Hill	Somerset	MS; OTH	4	Iron	Burial (1); Single find (1); ?Hoard (2)	N	N
42	Polden Hills	Somerset	MS	1	Iron/copper alloy	Hoard	N	N

Table 22.1 Multi-strand, tubular and thistle-terminal type torcs from Britain (for full details see Gazetteer). Finds marked * are lost. Abbreviations of torc types: BT: beaded-terminal rod torc; MS: multi-strand; OTH: other; TT: thistle-terminal rod torc; TUB: tubular; (B): bracelet; frag.: fragmented

No.	Site/location	County	Torc types	No. torcs	Material	Deposit type	Coins?	Frag.?
43.	Alrewas	Staffordshire	MS	*c.* 3	Gold/silver alloy	Hoard	N	Y
44.	Glascote	Staffordshire	MS	1	Gold/silver alloy	Single find	N	N
45.	Leekfrith	Staffordshire	MS; TT; TT (B)	4	Gold/silver alloy	Hoard	N	N
46.	Needwood Forest	Staffordshire	MS	1	Gold/silver alloy	Single find	N	N
47.	Shenstone	Staffordshire	TT	1	Copper alloy	Single find	N	?Y
48.	Great Finborough	Suffolk	MS	1	Gold/silver alloy	Single find	N	Y
49.	Ipswich	Suffolk	MS	6	Gold/silver alloy	Hoard	N	N
50.	Shepherd's Fen	Suffolk	TT (B)	1	Copper alloy	Single find	N	N
51.	Netherurd (*some finds lost)	Tweeddale	MS; MS (B); OTH (B)	?4	Gold/silver alloy	Hoard	Y	Y
52.	Middleton Hall	Warwickshire	MS	1	Gold/silver alloy	Single find	N	Y
53.	Westhampnett	West Sussex	TUB	1	Gold/silver alloy	Burial	N	Y
54.	Pershore	Worcestershire	?MS; ?TUB	?2	Gold/silver alloy	Hoard	Y	Y
55.	Dorchester*	Dorset	?MS	1	Iron	?Single find	N	N
56.	Arras*	East Riding of Yorkshire	?	1	Copper alloy	Burial	N	N
57.	Birdlip*	Gloucestershire	MS	1	Gold/silver alloy	?Burial	N	Y
58.	Marham*	Norfolk	?MS	1	Gold/silver alloy	Single find	N	N
59.	Narford*	Norfolk	MS	?3	Gold/silver alloy	Hoard	N	Y
60.	Pattington*	Staffordshire	?	1	?	?	?	?
61.	Mildenhall*	Suffolk	?	1	Gold/silver alloy	Burial	N	N
62.	Wallingford	Suffolk	?	5	Gold/silver alloy	?Hoard	N	?
63.	Rawden Billing*	West Yorkshire	?	1	?	?	?	?

Table 22.1 continued

included other torc types, they will not be discussed further. Three distinct groups of copper alloy torcs dating to the 1st century AD and beyond represent separate traditions, and will likewise not be considered further here. These are 'Wraxall'-type collars, largely found in the south-west of Britain (Megaw 1971; Beswick *et al.* 1990; Nowakowski *et al.* 2009), 'Baldock tradition' strip and rod torcs from the south-east (Marshall 2023), and beaded torcs, which are generally restricted to northern and western Britain (MacGregor 1976, 97–9, 113–15, nos 198–208; Beswick *et al.* 1990; Hunter 2018).

Torc types present in different finds are given in the Gazetteer and summarised in **Table 22.1** and **Figure 22.2**. The vast majority are multi-strand torcs similar to those seen at Snettisham, whilst a handful are tubular torcs (Essendon), tubular torc components (Norwich) or small sheet fragments which may represent tubular torcs (Pershore, Westhampnett, Weybourne). There are a handful of unique or highly unusual torcs classified simply as 'other' in **Table 22.1**, such as the lead alloy torc from Great Houghton, or the jointed iron torcs from Cadbury Castle. Others fall into groups. Two finds of gold alloy thistle terminal torcs (from Leekfrith and Caistor) and a possible third poorly recorded similar find from Thurrock, Essex, can most likely be stylistically dated to the 3rd or 4th centuries BC, with their closest parallels on the continent (see e.g. Farley *et al.* 2018). Finds of copper alloy torcs or bracelets in a similar form (Aylesford, Shenstone, Shepherd's Fen, Walbrook) may date to a similar early period or, especially given an apparent association with 1st to 2nd-century Romano-British finds at the River Walbrook in London (Marshall 2023, fig. 7), be either long-lived forms or examples of another type of 1st and 2nd-century AD copper alloy torc tradition comparable to the Baldock type, beaded torcs and Wraxall-type collars. The latter is perhaps particularly likely in the case of copper alloy rod torcs with beaded terminals: Colchester (i), Fremington Hagg, and Upchurch (the latter two associated or potentially associated with Early Roman material). The unusual iron and copper alloy torcs from 1st and 2nd-century AD hoards at Polden Hills and Upchurch are probably also part of such later traditions, and the same may be true of some of the other iron torc finds. Fitzpatrick (1999) noted that iron multi-strand torcs (with finds from Camerton, Danebury, Ham Hill, and Spetisbury) appear to have a south-western distribution similar to those of the Wraxall-type collars (**Fig. 22.4a**), and thus might represent a distinctive local tradition. Although, whilst the Camerton and Spetisbury finds were found alongside Early Roman material, the Danebury and Ham Hill finds appear to be Late Iron Age in date. Several of these distinctive iron torcs have clasps which

close the gap between the ring terminals, and Sellwood (1984, 371) suggested they might have functioned as slave chains similar to the gang chains from Llyn Cerrig Bach and Bigbury, although the twisted iron rods and ring terminals are certainly more decorative than those examples. The copper alloy multi-strand torc from Auldearn, dated stylistically and by its possible association with the nearby find of a large trumpet brooch, most likely also dates to the 1st or 2nd century AD.

The Snettisham finds comprise two main types of torc: tubular and multi-strand (see Typology in Ch. 13). In terms of deposition at least, the two types are contemporary. For example, tubular and multi-strand torcs were both recovered from Hoard F. But, it is difficult to be certain exactly how old artefacts were before they were put in the ground and therefore to determine precisely the relative duration of circulation for each type (below and Chs 20 and 21). Whilst the multi-strand torcs that form the majority of finds at Snettisham and elsewhere across the UK have traditionally been stylistically dated to the 1st century BC, dating evidence from Snettisham and beyond suggests a much longer period of production and circulation of these objects, perhaps dating as far back as the 3rd or 4th centuries BC (see below).

History of discoveries

The history of discoveries at Snettisham is outlined in detail in Chapter 4. The purpose of this subsection is to summarise the information presented in the Gazetteer and provide some background to the sequence of finds of similar torcs from the rest of Britain. Three major periods of discovery can be identified. A series of chance finds were made during the 19th century, such as at Burnley (1802), Netherurd (1806), Ulceby (1847), Needwood Forest (1848) and Clevedon (acquired by the British Museum in 1897). A second cluster of discoveries was made in a period of agricultural and commercial intensification between the 1940s and 1970s. In addition to the Snettisham finds made at this time, torcs were unearthed in Norfolk at Bawsey (1941 and 1944) and North Creake (1947). The Glascote torc was found in 1943, although it was not identified until 1970 (Painter 1970; 1971). Similarly, a torc was discovered near Diss sometime in 1942/3 but only came to light in 2010. From *c.* 1914 to the late 1960s up to 60 coins as well as a tubular torc fragment were eroded out of the cliffs at Weybourne near Sheringham. A broken torc was ploughed up in 1965 at Sedgeford (the missing terminal not being found until 2004) and building work in 1968 just outside Ipswich revealed five torcs, with a sixth being discovered in 1970 (Brailsford 1968; Brailsford and Stapley 1972; Owles 1969; 1970). A torc fragment was also discovered during farming activities at Middleton Hall in 1968 but was not identified by archaeologists until 1976. A small number of unusual torcs were also discovered during archaeological excavations between the 1930s and 1990s (see below), but, since the beginning of the 1980s most new discoveries have been made by metal-detector users (the exception being a torc unearthed during quarrying at Blackborough End, Middleton, Norfolk, in 1984). The first known metal-detected find was at Bawsey in 1984, followed by Hodder's discoveries at Snettisham in 1989. Since then, further discoveries have been made by metal detector at Bawsey (1987–90, 1996 and 2006) and Sedgeford (2004), and new finds made at Essendon (1992), Alrewas (1994), Colchester (1996), south-west Norfolk (2003), Newark (2005), Stirling (2009) and Caistor (2013). A more recent find was made in 2016 at Leekfrith (Farley *et al.* 2018). These latest two finds (at Caistor and Leekfrith) are also, by coincidence, stylistically the earliest known gold torcs from Britain, potentially pushing back the date of such objects into the early 4th century BC. This shows how quickly new discoveries can (and may again in future) change the archaeological narrative. See, for example, Adams *et al.* (2024), which discusses the recent find of the Pulborough torc (not included in the table and gazeteer here).

History of research

Considering some torcs were discovered as long ago as the early 19th century, it is surprising that torcs from Britain did not feature more prominently in the literature until at least the 1950s. Birch's (1846) 'On the torc of the Celts' examined the evidence for torcs in classical literature and iconography, including Late Iron Age coinage from Britain, but the artefacts he considers are now known to be Bronze Age in date. The Clevedon Torc terminal was illustrated in Smith's British Museum *Guide to the Antiquities of the Early Iron Age* (Smith 1905, fig. 126), but overall discussion of torcs only made up a single page of text (*ibid.*, 137–8) and the wording was not significantly updated for the 1925 edition (Smith 1925, 149–50). In his short note on the 'Torcs of the Early Iron Age in Britain' Leeds (1933, 467) identified the torcs from Ulceby, Lincolnshire as Iron Age, based on the bridle bits found with them. He also drew a distinction between the Ulceby torcs and the collars of the 'Wraxall' type discussed above, placing the torc from Needwood Forest and the Clevedon Torc alongside the Ulceby examples within his torc catalogue. The discovery of a torc terminal at North Creake prompted Clarke (1939, 60) to re-categorise published artefacts previously identified as something else. For example, prior to Clarke's study, the terminal from Netherurd was thought to be a 'sceptre head' and the terminal excavated by Bushe-Fox at Hengistbury Head was identified as the head of a linch-pin (Bushe-Fox 1915). The discovery of Hoards A–E at Snettisham and then further finds made during the 1960s and 1970s elevated the status of torcs to the level of an important artefact type worthy of extended discussion (cf. Sealey 1979). Following Stead's excavations in the early 1990s it became clear that a good proportion of all the Iron Age torcs ever recovered originate from Britain, particularly East Anglia (cf. Hautenauve 2005).

Aside from Leeds' distinction between torcs and collars, torcs were first categorised by Clarke in his publication of the initial hoards found at Snettisham (Clarke 1954). He drew a distinction between the tubular bodies of torcs from Hoard A and the multi-strand torcs found in many of the other hoards. Multi-strand torcs were further subdivided based on their terminals: in particular Clarke identified loop and buffer terminals. He also compiled a full catalogue of other British finds known at the time, setting British torcs in their wider European context. In his publication of the Snettisham excavations, Stead (1991a, 451–5, figs 2–10)

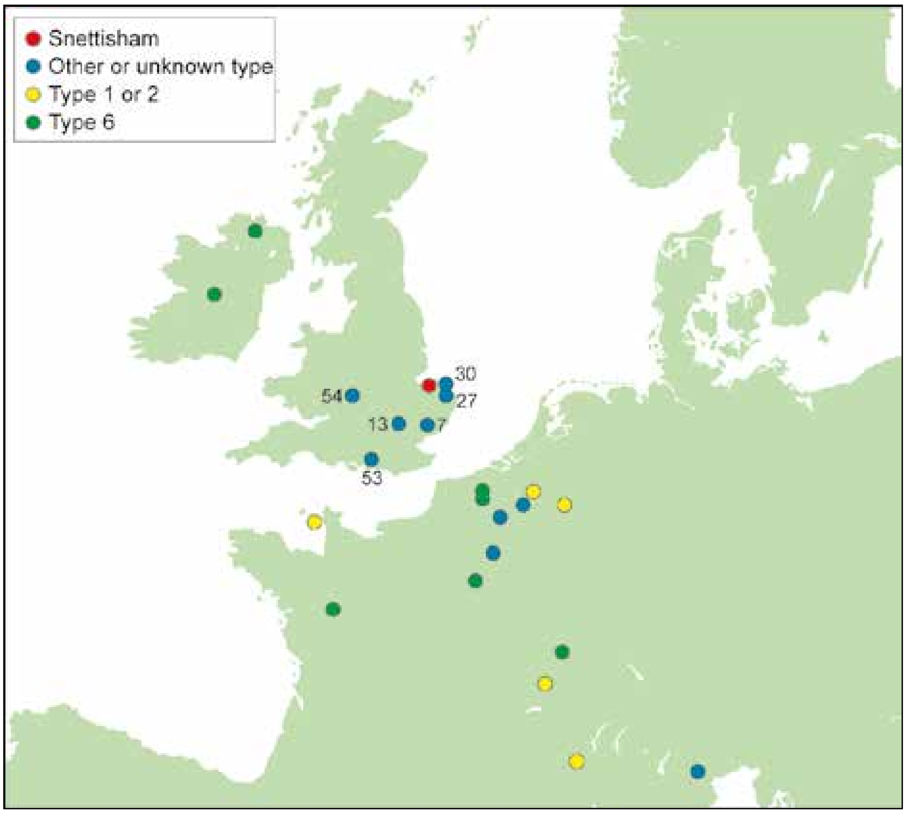


Figure 22.3 Distribution of gold tubular torcs of the types found at Snettisham, drawing on data from Fitzpatrick (2005), Hautenauve (2005), Roymans *et al.* (2012) and de Jersey (2021). Note that all types are represented at Snettisham. The 'knobbly' sheet gold torcs and arm rings of the types found at Aurillac, Fenouillet, and Lasgraïsses (France) and Stirling (Scotland) have been omitted, as has an unusual segmented tubular torc from Hungary (Hautenauve 2005, no. 229). Numbers are those from the Gazetteer and Table 22.1

defined six types based on his new discoveries (tubular torcs; and twisted wire torcs with loop, buffer, ring, cage and reel terminals), but overall Clarke's method of categorisation was not changed. Hautenauve's (2005) thesis on European gold alloy torcs included detailed discussion of British examples and her catalogue covers discoveries made up to the 1990s, including some of the finds from the Snettisham excavations (Hautenauve 2005, 232–56). She also constructed a 'typologie des torques des îles britanniques' (*ibid.*, 88–118), in addition to separate typologies for continental and Iberian examples. Like Clarke and Stead, she distinguished two broad types based on the construction of torc neck-rings: tubular and twisted. Within her category of 'les torques au corps torsadé' ('torcs with twisted bodies'), she identified two subsets: 'les torques à torsade simple' and 'les torques à torsades multiples'. The bodies or neck-rings of her 'simple twist' torcs comprise individual wires twisted/plied or coiled together (here referred to as Stage II construction), whereas the bodies of 'multiple twisted' torcs are made up of ropes, each comprising many wires together (here referred to as Stage III and IV construction, see Ch. 13). Simple-twist torcs were further divided into 14 subsets based on the type and number of terminal loops. Multiple twisted torcs were similarly subdivided, this time into 19 groups. Tubular torcs were split into five categories (globular buffer terminals, cylindrical tubes, trumpet ends, truncated and double buckle). In addition to torcs with tubular and twisted bodies, Hautenauve defined a third type: filiform. She identified six torcs of this type, most from Hoard F at Snettisham (F.1c, F.1d, F.57, F.58. F.59), but additionally an example of unknown provenance with a knot in the neck-ring acquired by the British Museum sometime before 1848 (see unprovenanced torcs in Gazetteer; Birch 1846; James and Rigby 1997, 46). Here, these finds from Hoard F are treated as a subset of tubular torcs (Type 1), since in all cases where a terminal is present, the neck-rings are hollow types.

Hautenauve's typology is considered too unwieldy and complicated for use in this volume, and the typology which is presented here is based on Clarke's original distinction between tubular and twisted with Stead's additional terminal types (see Ch. 13). Tubular torcs are divided into six groups. Multi-strand torcs are described as having Stage II, III or IV neck-rings (based on the number of stages of wire twisting/coiling/plying) and terminals are grouped as buffer, loop (either single or multiple), hook, ring, reel, torus or cage.

Distribution

Tubular torcs similar to those recovered from Hoard A (Type 6 in this volume, see Ch. 13) have been found in Ireland and parts of the continent in addition to Britain (Fitzpatrick 2005; Hautenauve 2005), and a similar although distinct torc was also found as part of the Broighter Hoard from Northern Ireland (**Fig. 22.3**). In contrast, the well-documented distribution of multi-strand torcs (e.g. Brailsford and Stapley 1972; Davies 1996, 72; 2008, fig. 66; Hutcheson 2004, ch. 6; 2007, 359–62) shows they are confined to Britain, with a concentration of finds in East Anglia (**Fig. 22.4a**).

By far the greatest number of torcs from a single site have been recovered from Snettisham, but a high proportion have also been found from elsewhere in Norfolk, most from the north-west of the county. In addition, six torcs were discovered at Ipswich, Suffolk (Brailsford 1971; Brailsford and Stapley 1972; Owles 1969; 1970). A smaller cluster of finds can also be observed in the West Midlands (**Fig. 22.4a**). Like the East Anglian finds, many have been recovered from a relatively confined area. For example,

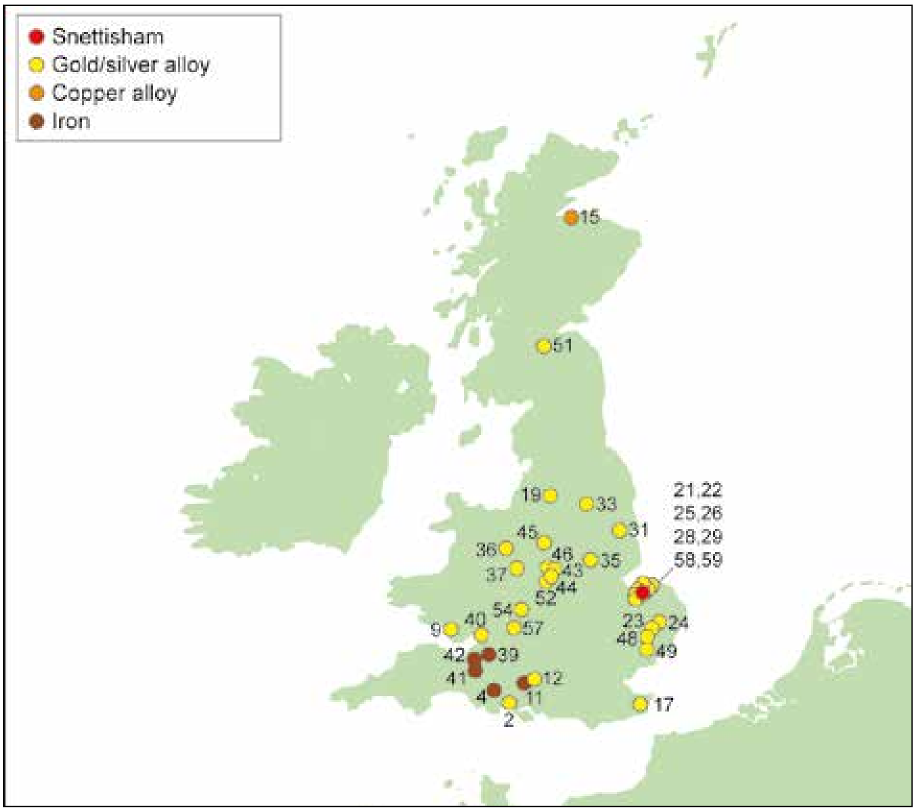


Figure 22.4a UK distribution of multi-strand torcs of the type found at Snettisham. These finds are generally restricted to Britain, though a similar torc is also known from Beringen, Belgium (Hautenauve 2005, no. 13). The wire torcs from Winchester and Stirling, which are rather different in construction, are omitted here. Numbers are those from the Gazetteer and Table 22.1

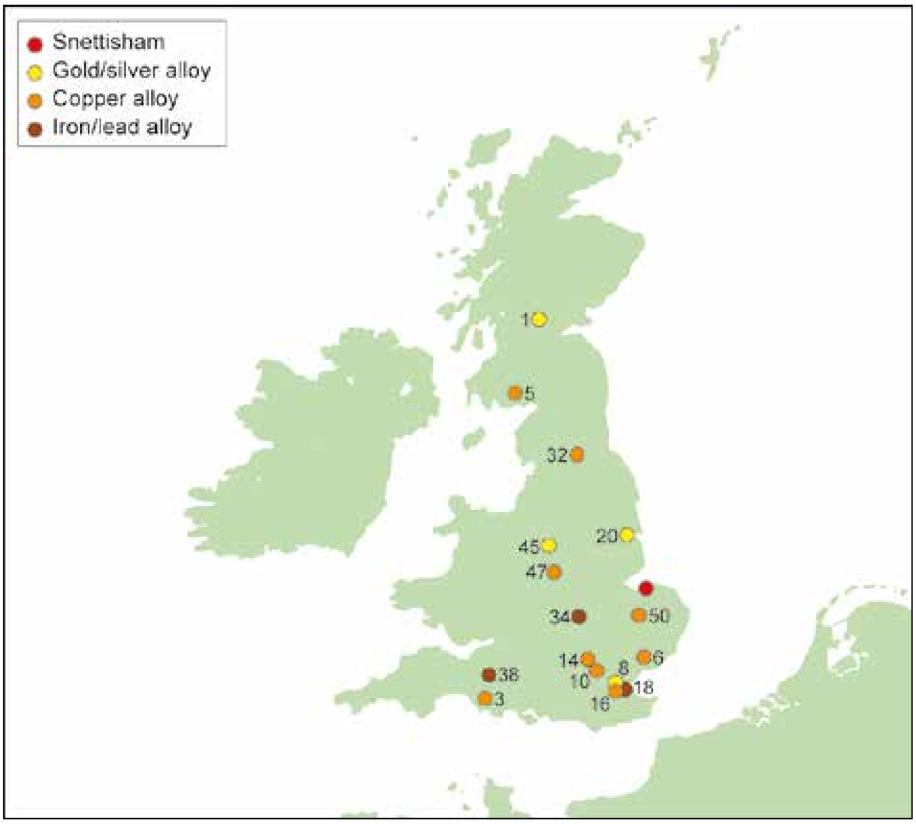


Figure 22.4b UK distribution of other torc types, including buffer terminal and thistle terminal torcs. Note that well-known later torc types such as beaded, ribbon, Baldock-type and Wraxall-type torcs are omitted, as these are more fully discussed elsewhere. Numbers are those from the Gazetteer and Table 22.1. Gazetteer entries 55–6 and 60–3 have been omitted as insufficient reliable information about these finds exists

Middleton Hall and Needwood Forest are only 16 miles apart, with Alrewas and Glascote located between the two in a zone roughly located between present-day Birmingham and Derby. The West Midland torcs are an extremely varied group, and some are quite visually distinct from most East Anglian examples. The wire and ring terminal fragments from Alrewas resemble finds from Snettisham, but Middleton Hall is the only multi-strand torc to have a braided (rather than simply twisted/plied) neck-ring (its terminals do not survive). The complete torcs from both Glascote and Needwood Forest have been described as having 'cushion' terminals. On the Needwood Forest example, these are quite distinctive, though Glascote is equally similar to some of the ring terminal torcs from Snettisham. This varied group from the West Midlands, centred on Staffordshire, may well represent a separate

manufacturing tradition from the East Anglian torcs. The discovery of an early torc hoard from Leekfrith, Staffordshire, most likely dating to the 3rd or 4th century BC (Farley *et al.* 2018) is a tantalising suggestion of possible independent early origins for the West Midlands torcs.

A small number of multi-strand torcs have been found outside of these two regions. These are thinly spread across Britain, ranging from the south coast to as far north as Scotland. More recent discoveries near Newark, Nottinghamshire and at Stirling, central Scotland, have strengthened this northerly distribution. Many of these 'outliers' appear more similar to East Anglian examples than those from the West Midlands. It is possible some could have originated from East Anglia, moving through trade and exchange (Joy 2015). Alternatively, they may represent locally made versions or interpretations of multi-strand torcs (Machling and Williamson 2018). The latter certainly seems to be true in the case of the unusual copper alloy torc from Auldearn (Hunter 2014a), although this more clearly fits in with local forms and styles, closely resembling aspects of the Scottish massive metalwork tradition. Either way, knowledge and use of torcs must have been widespread to account for the wide geographical distribution of these 'outliers'.

As with all distribution maps, the vagaries of discovery and patterns of deposition mean it is unclear exactly how representative a picture of torc usage is painted. For example, we only see artefacts that have entered the archaeological record, not those that were recycled to make something else. This is a particular issue for precious metal torcs because the materials are so readily recycled, and an alternative gold artefact form, coinage, was prevalent throughout the later Iron Age. The possibility therefore remains that torcs were far more common and geographically widespread than is now apparent, but in most cases were recycled rather than being disposed of in archaeologically visible ways. For example, commenting on the uneven distribution of gold torcs Colin Haselgrove (2015) stated, '…it seems likely that many powerful or significant individuals possessed torcs in Late Iron Age Britain and they regularly exchanged them, but outside the East Anglia "hotspot" we typically see glimpses of this only when they were incorporated in deposits that break with normal ritual traditions in an area…' (Haselgrove 2015, 34). This is perhaps supported by the fact that finds outside the main torc distribution areas are more likely to be small pieces of broken-up torcs, sometimes incorporated into coin hoards. Nevertheless, the two regional concentrations of finds are unambiguous. Certain absences are also notable; in East Yorkshire, an area with a strong burial tradition during the early period of torc manufacture (*c.* 250–150 BC), torcs are virtually absent (with only one possible bronze example from Arras, now lost), suggesting that they were not a normal part of local dress. Overall, the evidence seems to imply that torcs were distributed, in small numbers at least, across much of Britain but that they took on particular importance in East Anglia and the West Midlands. Such local importance would most likely have been reflected in increased numbers in circulation, as well as contributing to their relatively frequent selection for deposition.

Context of discovery

The Hengistbury Head torcs were the first British examples to be recovered during modern archaeological excavation (Bushe-Fox 1915; Cunliffe 1987). Since then, the only excavations which have uncovered precious metal torcs are those at Snettisham, although other unusual copper alloy and iron torcs (see **Table 22.1** and Gazetteer) have been excavated at Maiden Castle (1934–7), Cadbury Castle (1966–70), Danebury (1969–78), and Great Houghton (1996). The findspots of the Newark Torc, and hoards from Stirling (Hunter 2018), Leekfrith (Farley *et al.* 2018) and Essendon (unpublished) were also investigated subsequent to discovery.

A few patterns can be discerned in the findspot types of torcs from Britain. Iron torcs (such as the finds from Cadbury Castle, Camerton, Danebury, Ham Hill and Spetisbury) seem to be more common on settlement sites, often as part of wider deposits of material. Maiden Castle has also produced a small copper alloy rod torc or bracelet. Unusual torc types of probable 1st or 2nd-century AD date are most commonly found in the mixed hoards seen in this period (e.g. Upchurch, Fremington Hagg, Polden Hills).

Watery deposition of torcs is highly unusual, but two stylistically early copper alloy rod torcs with thistle terminals have been recovered from watery contexts in the River Medway (Fox 1959, 66) and River Walbrook, London (Marshall 2023). The Essendon hoards are also thought to have been deposited in a shallow pool in a bog (Stead 2006, 51). These hoards also contained weapons (though not in direct association with the torcs and coins). Since the Bronze Age, there had been a long-running tradition of depositing weaponry in rivers and watery places (Fitzpatrick 1984), and it is possible that at Essendon deposition rules governing weapons superseded conventions regarding torcs (the latter formed only a small proportion of the assemblages). The bracelets from Towton were reportedly found in a streambed, but there is considerable uncertainty about the accuracy of their reported findspot (see Gazetteer).

On the continent, many torcs have been recovered from graves, but this is rare in Britain where there are only five reports (of varying quality) of torcs found in inhumations, and one small probable torc fragment from a cremation burial at Westhampnett (**Table 22.1**; Gazetteer). The lead alloy torc from Great Houghton, Northamptonshire, was found in an unusual female burial (Chapman 2000–1). The skeleton lay face down and the hands may have been bound. The torc is also exceptional: it is crudely fashioned, and its two halves were originally bound with organic material. The possibility that its purpose was not the same as other torcs remains likely. Four other burials in Britain have supposedly produced torcs (though none were subject to controlled excavation, and three are now lost). A simple iron torc was found in a burial at Ham Hill, Somerset, apparently worn around the neck; other grave goods included an iron chisel and adze (Anon. 1886; Whimster 1981, 239). A gold alloy multi-strand torc recovered from Birdlip, Gloucestershire, may have been a grave good from one of the nearby burials, but there is no clear account of its discovery and it is now lost (Green 1949, 188, fig. 1a; Staelens 1982). A torc is also said to have been discovered in burial A5 at the Arras cemetery, East Yorkshire, although unfortunately this too is now lost (Stead

1979, 80). According to an account in a letter by a Dr Hull (noted by Greenwell 1906, 275), the torc was found worn around the neck. The burial also contained nine small jet beads and a copper alloy wheel ornament (Greenwell 1906, 301). A gold torc was apparently found at Mildenhall, Suffolk, in 1812 in an extended inhumation burial also containing two horses, an iron sword and a 'celt'; it was later melted down (Bunbury 1834, 610).

Most of the precious metal torc discoveries from Britain originate from hoards, or as single finds in the landscape such as the torcs from Newark and Sedgeford. Like Snettisham, most are dryland deposits positioned on higher ground, many overlooking river systems or, as at Snettisham, marine inlets or the sea. There are no obvious parallels to the great number of separate deposits and the sheer quantity of torcs from Snettisham, although in terms of the quantity of precious metals the Snettisham finds pale into insignificance to the massive hoard of 70,000 coins and at least 11 gold torcs from Le Câtillon I and II, Jersey, which weighed almost a ton when lifted (Miles and Mead 2015). Only three other UK sites (Bawsey, Essendon and Hengistbury Head) have possible multiple hoards including torcs, and in most cases the evidence is ambiguous (**Table 22.1**; Gazetteer). The discoveries at Bawsey were made over a number of years no more than 80m apart. They could represent the remains of a single scattered hoard, or several separate deposits. The hoard containing a tubular torc from Essendon, Hertfordshire, is thought to have been one of three hoards deposited in the same location (though the other groups did not contain torcs). The torc and bracelet fragments from the Late Iron Age settlement at Hengistbury Head were found alongside many Late Iron Age coins and in the vicinity of metalworking debris, including evidence for hearths and large lumps of copper and silver alloys (Bushe-Fox 1915, 24–6, 72–4). The excavator, Bushe-Fox, noted distinct clusters of finds. He proposed that the area, 'Site 33', might have been a structure, though the evidence for this is slight. Cunliffe interpreted it as an area of metallurgical activity dating to *c.* 50 BC–AD 50.

With this general absence of contextual information in mind, the best we can say at present is that most British precious metal torcs are from hoards, but because many were found by chance we have little information concerning exactly how the hoards were arranged in the ground (see Gazetteer). For deposits where torcs are the main or only objects present, there are, broadly speaking, two hoard types. Some (Bawsey, Hengistbury Head, Alrewas, Narford) consist of groups or bundles of fragments which show evidence of being deliberately broken up and sometimes interlinked (Hengistbury Head, Alrewas), or melted (Narford). A number resemble the bundles or collections noted at Snettisham, especially from Hoard F. For example, prior to deposition the Alrewas torcs were cut up, bent out of shape, bundled together and looped through a gold alloy ring. A torc fragment with a buffer terminal and a gold alloy torc/bracelet from Hengistbury Head were also found bound together with pieces of wire (Cunliffe 1978, fig. 18). The other type of hoard is the 'nested' arrangement of torcs, seen or suspected at Ipswich, Leekfrith and the Stirling area Hoard. From the account made of their discovery, it is possible that some of the Ipswich torcs were linked before they were placed in the ground (Owles 1969, 208). But as with a number of the Snettisham hoards where 'nests' of torcs were tightly packed in the ground, this linking could have resulted from torcs being packed together in close proximity. In sum, we can only speculate as to the arrangements of most other torc hoards. But it is possible that as at Snettisham, torcs were deposited arranged in nests, or collected in bundles (Joy 2016).

Associated finds

Mixed hoards including torcs again fall broadly into two types. In some, one or more complete torcs are included alongside other complete (or largely complete) objects: a 'matching' brooch at Auldearn, harness fittings at Ulceby and Polden Hills. But the most frequent type of mixed hoard combines torcs (often fragmentary) with coins and/or ingots. Mixed torc and coin hoards are also relatively common on the continent (Fitzpatrick 2005). Torcs may be either a major component of the deposit or appear only as smaller fragments incorporated in amongst the coins. The gold tubular torc from Essendon was discovered at the same time as 253 Iron Age gold coins and four ingots (probably representing at least two hoards, Stead 2006, 51), with at least some of the coins found inside part of the tubular torc. The Hengistbury Head torc and bracelet fragments were found alongside many coins and pot sherds. It is difficult to date the torcs based on the associated material because the coins have a wide chronological range, spanning from around 100 BC to the 2nd century AD and the pottery from the area spans 'all periods', though Cunliffe suggested the Site 33 deposits most likely fall in the period *c.* 50 BC–AD 50 (Cunliffe 1987, 75, 136–41). The Netherurd torcs were found with 'upwards of 40 gold coins' (Feachem 1958, 112). Two other coin hoards include only very small torc fragments: a piece of tubular torc was discovered alongside around 200 gold coins (predominantly thought to be Gallo-Belgic E types) at Weybourne (Chadburn 2006, no. 14), and two small torc fragments were mixed in with a mid-1st-century AD coin hoard at Pershore.

Torc hoards B, C, E and F at Snettisham also included coins and, in some cases, ingots. Coins are discussed further below, but the ingots from Snettisham come in three main forms. Most are linear 'bar' ingots, or metal lumps (some resembling coin blanks), and there are at least two triangular ingots (B/C.84 and S.105). No crucible or mould fragments have been recovered from Snettisham, but the size and form of the ingots conform well with the evidence for crucibles and moulds found elsewhere (cf. Webley *et al.* 2020). For example, the crucible and furnace debris from Weelsby Avenue, Grimsby, included fired clay triangular crucibles and a bar-shaped mould (Foster 1995, figs 32–3). Similarly, several triangular crucibles, in addition to a small bar-shaped investment mould and two fragments of copper alloy rod, were recovered from Fison Way, Thetford (Gregory 1991, 138–41). Arguably the most common crucible type, the triangular shape, is relatively widespread with examples recovered from Wales and much of southern England (Musson *et al.* 1991, 272–4; Webley *et al.* 2020).

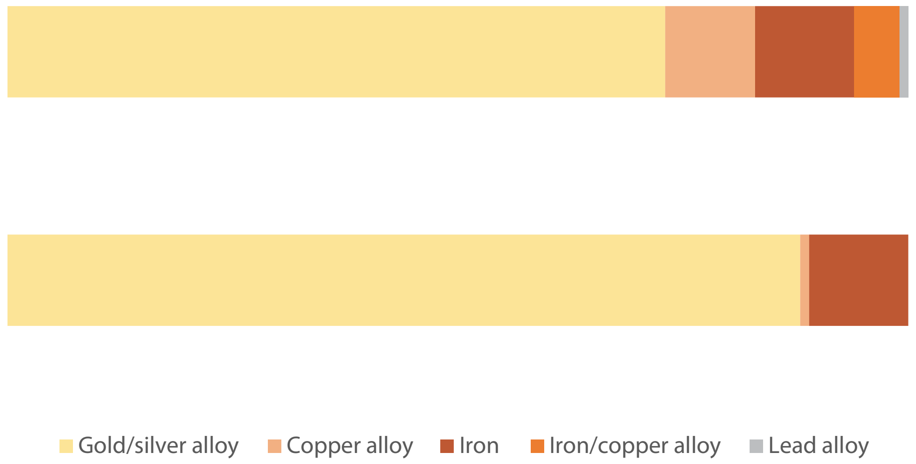


Figure 22.5 Relative proportions of metal types for all torcs and torc fragments from other UK sites (above, n=89, finds as listed in Table 22.2) and multi-strand and tubular torcs only (below, n=65). Compare the values for Snettisham complete torcs and fragments in Figure 13.14

Materials

Most of the torcs from Britain found outside of Snettisham are made from gold or gold/silver alloy (**Fig. 22.5**), with small numbers of copper alloy and iron torcs and a single example of an unusual lead alloy torc from Great Houghton. However, note that later copper alloy torc traditions (e.g. beaded torcs, 'Wraxall' collars and Baldock-type torcs) are not considered here. There are six examples of iron multi-strand torcs from elsewhere in the UK, but none from Snettisham.

The predominance of precious metal torcs in non-Snettisham UK torc finds is particularly pronounced when only multi-strand and tubular torcs (the types present at Snettisham) are included (**Fig. 22.5**, lower). Outside of Snettisham, there is only one find of a multi-strand copper alloy torc, the example from Auldearn in Scotland, which is most likely a later object, dating to the 1st or 2nd century AD (see Gazetteer). At Snettisham, in contrast, copper alloy multi-strand torcs make up over 30% of complete torcs and bracelets, and almost 50% of fragments (see **Fig. 13.14**), showing that here local traditions of torc manufacture and deposition included both gold/silver alloy and copper alloy objects. Elsewhere, precious metals appear to have been preferred, though this may reflect depositional practices rather than the use and wearing of torcs. It is tempting to suggest that the extensive depositional practices evident at Snettisham caught up and incorporated a wider variety of torcs than was usual practice in the region, including copper alloy examples which might otherwise have been recycled rather than deposited. The fact that copper alloy torcs from Snettisham appear more likely to be fragmented than their precious metal counterparts is most likely due, at least in part, to corrosion and post-deposition processes (there are many extremely small wire fragments from Hoard F). However, there is a slight suggestion that gilded copper alloy torcs were less likely to be fragmented than non-gilded examples (see Ch. 13). This could be because of the difficulty in recycling such objects, or they may have been treated differently owing to their colour and appearance.

Origins and importance of gold

Many of the most complicated and heavily decorated objects from Snettisham are made from alloys of gold (**Fig. 22.5**, see also Chs 17, 18 and 21). There is a widely signalled hiatus in the use and production of gold items in southern Britain from around 800 BC to the 3rd or 4th centuries BC (Northover 1995a; La Niece *et al.* 2018). This stands in stark contrast to the widespread earlier presence of Bronze Age gold ornaments, particularly those from graves and hoards, many of which are thought to have been made from British and Irish sources of gold (Northover 1995a; Needham 2012; Standish *et al.* 2015). The archaeological record in this respect also differs from the continent where gold objects are found in Late Hallstatt and early La Tène burials (e.g. Biel 1985).

Gold objects begin to reappear in the archaeological record of southern Britain from around 400–300 BC, with the earliest objects (all stylistically dated) being gold V-shaped finger-rings and early torcs such as the examples from Leekfrith and Caistor (Joy 2015; La Niece *et al.* 2018). These objects resemble continental types and at least some are likely to be imports, though the alloy composition of the Leekfrith torcs raises the possibility that they may more likely be of local manufacture (Farley *et al.* 2018). In northern Britain and Ireland there was also a separate gold ribbon torc tradition, dating from *c.* 300 to 50 BC (Hunter 2018, 432). Stylistically early torcs from Snettisham such as L.19 and F.72 (see Ch. 21) may also represent some of the earliest known gold objects from Iron Age Britain.

The interruption in gold production is difficult to explain and it may be that a small number of gold items continued to be made but simply do not appear in the archaeological record. Perhaps links to gold sources broke down at the end of the Bronze Age, or gold was no longer socially desirable, with bronze becoming the preferred material to manufacture prestige items. Provenancing gold is notoriously difficult (cf. La Niece *et al.* 2018). It is possible that native gold sources were used to make torcs, for example if there was pre-Roman mining at the gold mine at Dolaucothi in South Wales, but there is no direct evidence for the exploitation of insular gold deposits in the mid- to Late Iron Age (Bayley *et al.* 2008, 41). Given its prior absence from the archaeological record, perhaps the impetus to use gold again derived from contacts with the continent. Certainly, the earliest known Iron Age gold objects from Britain, include likely imports (Joy 2015; La Niece *et al.* 2018). This suggests the likelihood that precious

metal artefacts and coins may well have found their way to Britain from the continent, albeit probably in small quantities. It is likely that at least some of this imported material was used to make torcs (Joy 2015; La Niece *et al.* 2018), and probably also the first insular British coinage. The source of the gold might well have been known and understood by the makers and wearers of torcs, carrying additional layers of meaning that are now hard to unpick.

In archaeology we deal almost exclusively with those objects that endure, but metals in particular are easily recycled. Unless they are intentionally removed from circulation, they can be transformed again and again rather than being fixed in a particular form. Gold is a substance which retains its identity no matter what form it takes (Oakley 2013, 64). It is heavy, highly resistant to corrosion, has a reflective, shiny surface and a distinctive colour. It can be hammered to form fine wires and very thin sheet, or quickly melted down and cast into new forms. Like silver, it can be combined and recombined, meaning, as Oakley has argued, that it holds the '…potential for an infinite number and range of future amalgamations that undermines the stability of any current object: any existing gold or silver object can all too easily be perceived as a mass of raw material for the manufacture of a future object-in-waiting' (Oakley 2013, 64). Oakley's focus was artefacts with hallmarks, where the value placed on gold was similar to the importance we place on gold today. Gold is so obviously valuable in many modern societies that it can seem only logical that people in the past ascribed it similar worth. But any or all of the qualities of gold we have highlighted above could have been important in an Iron Age context, and it is possible that varying qualities and facets were drawn on at different points in the life of an object. The same may be true for objects which are not entirely made of gold but appear to be gold because of their surfaces. It certainly seems that the alloys and materials used in the objects from Snettisham were deliberately manipulated to affect their surface colour (Ch. 17). Elsewhere, there is much evidence for societies valuing substances for their material properties such as colour or shininess (Saunders 1999). There has been extensive discussion of the role and importance of colour in Iron Age Britain. Creighton (2000, 38–40) argued that the distinctive yellowish colour of early gold Iron Age coinage might have been associated with high status or even kingship, and Hutcheson (2007, 361–2) has argued that colour may have been an important factor in the ordering of the Snettisham hoards (this is discussed further in Ch. 23). The incorruptibility of gold can also lead to links or associations with the divine (Oakley 2015, 160). Gold's durability, combined with its relative scarcity but wide availability, is important for its role in many societies as a store of wealth or medium of exchange (Oakley 2015, 160–1). Its potential to be easily re-formed into something else also means that gold objects are relatively unstable: social effort and will is required for it not to be re-formed into something else (Oakley 2013, 64).

The 'vitality of materials' has a growing currency in the social sciences (e.g. Bennett 2010; Drazin and Küchler 2015). In social terms, the materials used to make torcs were not 'raw' (cf. Drazin 2015, xviii). As is particularly the case with metal artefacts, but also potentially those made of any material which has been re-used or reworked to form something else, traces of previous forms remain in the material or substance of the new object. The concept of 'informed material' provides a means by which we can think about these material traces. According to Bensaude-Vincent and Stengers (1996), whilst researching and developing chemicals, 'instead of imposing a shape on the mass of material, one develops an "informed material" in the sense that the material structure becomes richer and richer in information' (Bensaude-Vincent and Stengers 1996, 206). Andrew Barry (2005) further developed this idea. Discussing how we can understand the notion that materials can be informed he stated, 'one way of understanding the idea that a material entity (such as a potential drug molecule) could be informed or "rich in information" would be to say that the material *embodies* information' (Barry 2005, 57, his emphasis). Drawing on theories developed by Whitehead (1978; 1985), Barry argued that rather than viewing material objects as concrete manifestations to which meanings are added, we should view them instead as 'historical' forms (Barry 2005, 64). Things endure but their lives do eventually end, whereas the materials they are made from do not. When objects are recycled, although the atoms and molecules they are made from are not the same as they were before, previous traces endure. In other words, as materials flow from form to form, they become more and more 'informed', containing information about previous material forms.

One of the outcomes of research into informed materials has been to challenge the notion of the social life or 'biography' of things. The biography metaphor does not fit materials, it is argued, as they are not born and do not die, instead materials flow and transform. Hence, according to Drazin, 'the "life" of materials concerns questions about how materials are "vitalist", what they do and how they have effects, how they have meaning, how they are known and what social and cultural forms happen through and around them' (Drazin 2015, 14). The concept of 'informed' material is useful in a number of respects when considering the Snettisham remains. First, the material an object is made from is socially significant. Second, traces of past material forms are preserved in the materials objects are made from. This has long been recognised in terms of scientific examination of trace elements, but if knowledge of past forms and the 'origins' of materials is preserved in the social memory and viewed as significant, then this is an important observation. In short, the concept of informed material provides a means by which to conceptualise and approach the flow and transformation of materials as they change form. The enduring objects we encounter in archaeology contain information and traces of these past material forms and their flow (Needham 2001).

Wear and use

As at Snettisham, most British torcs appear to have been used, with many damaged and/or showing signs of wear, implying they were not made especially for deposition. For example, the torc from Middleton Hall, Warwickshire was missing both its terminals, and the torcs from Leekfrith show clear wear patterns (Farley *et al.* 2018). Many torcs also

Torc	Type	Date	Method	Source
Great Houghton	Other	545–203 cal BC (95% probability)	Radiocarbon (human bone from burial)	Chapman, A. 2000, table 6
Westhampnett	Fragment: ?Tubular	200–80 cal BC (95% probability)	Radiocarbon (cremated human bone from burial)	Haselgrove *et al.* 2018, table 1
Ulceby	Multi-strand	300 BC–AD 100	Stylistic: associated bridle bits	Macdonald 2007b
Essendon	Tubular	80–60 BC or *c.* 20 BC–AD 40	Associated coinage	Fitzpatrick 2005; Stead 2006
Netherurd	Multi-strand	120–80 BC	Associated coinage	Haselgrove 2009
Pershore	Fragments: ?Multi-strand; ?Tubular	40 BC–AD 50	Associated coinage	Unpublished
Weybourne	Fragment: ?Tubular	*c.* 60–50 BC	Associated coinage	Haselgrove 1987, 328
Upchurch	Other	*c.* AD 180	Associated coinage	Payne 1893, 75–6
Polden Hills	Multi-strand	AD 40–70	Stylistic: associated horse-gear	Brailsford 1975b

Table 22.2 Dating of torcs and torc deposition from other sites in Britain, based on associated finds

appear to have been deliberately fragmented. One of the torcs from Hengistbury Head comprised a single buffer terminal and neck-ring section, and fragments from Forncett, Gayton, Great Finborough, Pershore and Shepherdswell with Coldred all show evidence for being cut up. This fits with the impression gained from careful examination of the Snettisham torcs (Ch. 20) and wider patterns noted for other artefact types, particularly decorated artefacts (Joy 2010; 2011; 2014).

In contrast, the torcs from Alrewas, Staffordshire are unusual as, in his unpublished Treasure report on the artefacts, Ian Stead implied they were unfinished. The complete gold bracelet from Hengistbury Head (Cunliffe 1987, 156–7) has mismatched terminals – one simply formed from loops of the neck-ring, and the other hammered and worked, with the possible addition of more metal, to form a ring terminal. It is possible the loop terminal is therefore unfinished, not yet having received such treatment. The ring terminal from Netherurd may also never have been joined to a neck-ring (Machling and Williamson 2018). At least one torc from Snettisham (S.17) shows clear signs of being possibly unfinished, with casting sprues remaining on its terminals, and H.3 may similarly be incomplete (Ch. 20). This indicates that torcs could be deposited at various different stages in their biographies or itineraries, although, as suggested in Chapter 20, it may also imply that simplistic modern notions of a simple passage from work in progress, to finished object, to worn and potentially repaired object-in-use, to scrap, are anachronistic in relation to Iron Age torcs; the reality may have been more complicated.

Chronology

Although Smith (1905, 137; 1925, 149) attributed torcs to the Iron Age, he was understandably reluctant to define a chronological sequence until further examples had been uncovered. With more discoveries to work with, Leeds (1933, 466) suggested they belonged to the 2nd or 1st centuries BC based on his dating of the bridle bits found with the Ulceby torcs. Working on the first discoveries from Snettisham and drawing on continental evidence, Clarke (1954, 44 and 52) dated the tubular torcs from Hoard A to the 2nd or 1st centuries BC and suggested that multi-strand torcs belonged to the 1st century BC and early 1st century AD. Brailsford (in Brailsford and Stapley 1972, 226) favoured a mid-1st-century BC date for the Ipswich torcs and tentatively recommended a typological sequence moving towards larger terminals, although he later contradicted himself by also pointing out that the chronological significance of typological features is doubtful because it could also result from regional variation. Sealey (1979, 165) was the first to conduct a comprehensive dating audit and cited the absence of torcs from Early Roman hoards in East Anglia to indicate that they were made before AD 43. He then closely examined the coins found in the Snettisham, Weybourne and Netherurd hoards to refine his dating. Largely following the coin dating of Allen and Scheers, he concluded that the three hoards were all deposited in the mid-1st century BC, around the time of the Gallic Wars (Sealey 1979, 167).

Clarke, Brailsford and Sealey were all limited in their discussions because of a lack of good contextual information. As we have seen, many torcs were chance discoveries from the 19th and early 20th centuries. Of the more recent finds, most were made by metal-detector users in disturbed plough soil. This means that we are largely reliant on associated dating of other artefacts deposited with torcs, such as coins and horse-gear, as well as European parallels for those torc types, such as tubular torcs, also found on the continent. Dating of these artefacts, particularly Gallo-Belgic coinage, has changed since Sealey's analysis (cf. Haselgrove 1993, table 1; 1999, 164–8). Later discoveries and analyses, including radiocarbon dating of organic remains found inside neck-rings and adhering to torcs have also significantly improved our understanding of torc chronology (Garrow *et al.* 2009; **Table 5.2**).

Table 22.2 summarises the torc finds from Britain which can be more directly dated through associated finds, coins, or organic material. Beyond Snettisham only two torcs have radiocarbon dates: the lead alloy torc from Great Houghton, Northants (Chapman 2000–1), and a small fragment of gold foil from a cremation burial at Westhampnett, West Sussex, which is likely from a tubular torc (Fitzpatrick 1997, 97–9; Haselgrove *et al.* 2018). The lead torc from Great Houghton is the earliest datable torc find from Britain by some margin, but it is also highly unusual,

and it is unclear how it fits within the wider group, if indeed it is related at all. The tubular torc fragment from Westhampnett has been dated by association with cremated human remains from the burial in which it was found to the 2nd or early 1st century BC.

Torcs are also found in association with a range of artefact types. Probably the most useful for dating purposes are coins. Dates for torcs found with coins (beyond Snettisham) are summarised in **Table 22.2** and follow Haselgrove's chronology (1993, table 1; 1999, 164–8). The finds from the Polden Hills hoard and Upchurch represent a very different style of torc (an iron core wrapped around with copper alloy wire) and are most likely a later tradition distinct from the types found at Snettisham. They are perhaps better situated alongside Wraxall-type collars and beaded torcs of a similar date and will not be considered further here. Tubular torc fragments, including two terminals, were discovered at the same time as coins and ingots at Essendon. The overall date range of these coins is quite wide, spanning more than a century. They cluster into two groups and it is possible they originate from two hoards containing coins: one dating from *c.* 80–60 BC, the other from *c.* 20 BC–AD 40. It is tempting to suggest that the tubular torc was associated with a hoard containing the earlier coins. Unfortunately, because the metal-detector users were unable to satisfactorily identify the coins found in the torc terminal, it is not possible to date the deposition of the Essendon torc fragments more closely than *c.* 80 BC–*c.* AD 40. Coins were found with the torc fragments at Hengistbury Head, but their association is not proven and they covered a very broad span of time (Cunliffe 1987). The Netherurd torcs were found with over 40 gold 'globules-à-la-croix' or 'bullet' coins (Hunter 1997, 515). The distribution of bullet coins is centred in Belgic Gaul, with a small number of finds in south-west England (Fitzpatrick 1992b, 10; Haselgrove 2009, fig. 1; Sills 2003). These coins date from the late 2nd century BC to the early decades of the 1st century BC, with those from Britain seen to belong to the later stages of the series (Haselgrove 2009, 184–5). Finally, very small torc fragments were found with coin hoards at Weybourne, Norfolk and Pershore, Worcestershire. At Weybourne, a small fragment of gold sheet, perhaps from a tubular torc, was found at the same time as coins on the beach. Haselgrove (1987, 328; see also Sealey 1979, 166) noted at least 63 coins, predominantly Gallo-Belgic E types, and speculated the finds originated from two hoards. Unfortunately, owing to the nature of the discoveries, the association between specific coins and the torc fragment is unclear. The Pershore hoard contains a small fragment of twisted wire alongside south-western Iron Age coins minted from 40 BC–AD 50.

Torcs have also been found in association with other types of artefact. Three fragmentary bridle bits and a bracelet were discovered alongside the torcs from Ulceby (May 1976, fig. 76). The bracelet is not closely datable, but the bridle bits belong to Palk's (1984, 7–8) 'double-jointed snaffle' class. These are also known as three-link bridle bits. The group was further subdivided by Palk and the example from Ulceby belongs to class A, described as possessing an 'iron core with sheet bronze casing'. Palk's subdivision is based on technology and seems to have little or no chronological significance. The double-jointed snaffle is one of Palk's largest groups including finds from across the country, appearing in East Yorkshire graves and at Llyn Cerrig Bach in Anglesey, as well as Meare Lake Village. Consequently, firm dating is difficult. In his analysis of the bronze work from Llyn Cerrig Bach, Philip Macdonald (2007b, 53–72) discussed the dating of three-link bridle bits in detail. According to Macdonald the earliest examples probably date from as early as the 4th or 3rd centuries BC, but the type may have continued in usage as late as the early 1st century AD (Macdonald 2007b, 72; see also Palk 1984, fig. 17). Unfortunately, the presence of 'pseudo-stitch' decoration on the Ulceby bridle bit does not help in this instance as pseudo-stitch decoration has a similar date range (Macdonald 2007b, 63). Macdonald's dating of three-link bridle bits is possibly a little conservative. For example, Bayesian modelling of radiocarbon dates obtained from East Yorkshire chariot burials has indicated that these probably clustered in the late 3rd and early 2nd centuries BC (Hamilton *et al.* 2015, 651). It is possible therefore that while some of these bridle bits could be as early as the 4th and early 3rd centuries BC, most probably dated from the later 3rd to the 1st centuries BC. In sum, while not definitive, the Ulceby deposit could be contemporary or possibly earlier than the deposition of the hoards at Snettisham.

For those torc types which have not been found in association with organics or other artefact types, we are reliant on stylistic dating. Of the torcs found in Britain, the copper alloy example with thistle-shaped buffer terminals from Aylesford, Kent is stylistically perhaps the earliest. It appears to belong to a type distributed from Central Europe to France and dating from the 6th to the 3rd centuries BC (Hautenauve 2005, 67–70). There is a possibility it could be an import as Jope (2000, 16, 234) has suggested, but the wide distribution of this type also does not exclude the possibility it was manufactured in Britain. However, the difficulty of stylistic dating for such objects is shown by the fact that a similar torc from the River Walbrook in London appears to have been discovered in association with 1st and 2nd-century AD Romano-British material (Marshall 2023), and thus may represent a long-lived object type.

As was outlined above (**Fig. 22.3**), tubular torcs are also found on the continent. In Hautenauve's catalogue of torcs, she argued that the large-bodied tubular torcs, like the (Type 6) examples from Snettisham Hoard A, date to the first half of the 1st century BC (Hautenauve 2005, 87), and narrower tubular torc types (1 and 2) to the first half of the 2nd century BC (2005, 77). Similar torc finds appear in the Le Câtillon II hoard, Jersey, alongside around 70,000 coins Late Iron Age coins. Fitzpatrick (forthcoming) suggested a date for the deposition of this hoard in the mid-1st century BC. Evidence from Chapter 20, where it was shown that the tubular torcs from Snettisham were far less worn than the multi-strand examples, might support the idea that at least at Snettisham these objects were relatively new when they were deposited, perhaps decades old or less, whereas some of the multi-strand torcs from Snettisham could have been over 100 years old at the time they were taken out of circulation.

Table 22.3 summarises the dating evidence available for each of the Snettisham torc hoards, ranging from

Snettisham torc hoard	Torc type(s)	Art styles present	Radiocarbon dates	Terminal date from associated coinage	Source
A	Tubular	V	-	-	See Ch. 21
B	Multi-strand	-	-	60 BC	See Ch. 15
C	Multi-strand	-	-	60 BC	See Ch. 15
D	Multi-strand	-	-	-	-
E	Multi-strand	V	-	60 BC	See Ch. 15; Ch. 21
F	Multi-strand; Tubular	II, III, V	F.168: 370–120 cal BC (95.4%); carbonised roundwood < 10 years old	80–60 BC	See Ch. 15; Ch. 21; **Table 5.2**; Garrow *et al.* 2009
G	Multi-strand	-	-	-	-
H	Multi-strand	-	-	-	-
J	Multi-strand	-	-	-	-
K	Multi-strand	-	-	-	-
L	Multi-strand	III, V	L.6: 360–110 cal BC (93.8%); lime wood fibre string <5 years old	-	See Ch. 21; **Table 5.2**; Garrow *et al.* 2009

Table 22.3 Dating of torc hoards from Snettisham

radiocarbon dates (for Hoards F and L), to associated coinage (Hoards B, C, E and F) and the art styles present on the torcs themselves (Hoards A, E, F and L).

As discussed in Chapter 21, it is difficult to use art styles to closely date the manufacture of the torcs, since many styles seem to have remained in use over a long period of time. For example, a single object in Hoard F (tubular torc fragment F.31a) mixes the supposedly earlier 'Vegetal' style (Stead's Style II) with Stead's Style V. Thus, for the vast majority of the torcs, the decoration cannot be more closely dated than the 3rd century BC to 1st century AD. It is likely, however, that the small number of 'Plastic Style' torcs (Style III) present in Hoards F and L (F.72 and L.19a) may be some of the earlier objects from the hoards. Torc L.19a (the so-called 'Grotesque Torc'), in particular, shows extremely heavy levels of wear, and has been extensively repaired (see Ch. 20).

The two radiocarbon dates taken from the Snettisham torcs (**Tables 5.2**, **22.3**) were both from material under 10 years old. We cannot be sure when the lime wood fibre was wrapped around torc L.6, but the small piece of carbonised wood from F.168 was inside the neck-ring and was used as part of the manufacturing process (Chs 17, 19; Cartwright *et al.* 2012). This date therefore provides an indication of when the object was manufactured, not when it was deposited. Given the terminal dates obtained for the deposition of the Snettisham hoards based on associated coinage (see below), F.168 at the very least was most likely in circulation for a long time before it was deposited, and may well have been an heirloom well over a century old (Joy 2016). The same is also possible in the case of L.6.

The coins from Snettisham Hoards B, C, E and F are discussed in Chapter 15. Stead (1991a, 165–6), argued that the mixture of coins from the hoards suggested they were deposited before Caesar's incursions into Britain. Haselgrove (1993, note 37; 1999, 182) stressed the significance of the absence of Gallo-Belgic E coins (the predominant gold coinage in circulation *c.* 60–50 BC), which he argued indicate that Hoards B, C, E and F were deposited sometime before *c.* 60 BC. Whilst dating of some of the types present at Snettisham has been revised since Haselgrove was writing, the broad picture remains similar, and the dating of the coins from Hoards B, C, E, and F support the idea that these hoards were more or less contemporary (Ch. 15). The latest coins in Hoard C are potins dated by Holman (2016, Ch. 15) to *c.* 75/70–60/55 BC, with the composition of the assemblage suggesting that the hoard was deposited around 60 BC or shortly thereafter. The Gallo-Belgic gold coins from Hoard F terminate with issues minted *c.* 80–60 BC, while Hoards B and E each contain a singular insular gold issue which may have been minted in the period *c.* 60–50 BC (based on Sills' revised dating, see Ch. 15).

Thus, the coin evidence suggests that Hoards B, C, E and F were likely deposited around the mid-1st century BC, and probably around or before 60 BC, pre-dating Caesar's expeditions to Britain. As the range of torcs found in Hoards B to L are so similar, it seems likely that the other torc hoards from Snettisham were deposited around the same time, although strictly speaking Hoards A, D, G, H, J and K are dated only stylistically, and the radiocarbon date from Hoard L is earlier (comparable to that from Hoard F).

It is entirely possible (and perhaps likely) that the torc hoards were all deposited over a fairly short period. However, this cannot be conclusively demonstrated. Given the early radiocarbon dates from Hoard F and Hoard L (at least compared to the coin finds from the site) it is apparent that multi-strand torcs were in circulation by the 2nd century BC at the latest and most probably during the 3rd or even 4th century BC. Thus, some of the torc hoards which do not have a *terminus post quem* provided by coinage could have been assembled and deposited much earlier. While the editors of this volume tend to prefer a shorter chronology for the deposition of the hoards, a conservative date range of *c.* 350–60 BC is given here for Phase 3 (the period which saw the deposition of the torc hoards, see Ch. 8), allowing for the possibility of a longer tradition of deposition at the site.

In summary, other datable torc hoards, such as Essendon, share similar chronologies to Snettisham. The general absence of torcs deposited with Gallo-Belgic E coins (except the fragment from Weybourne) indicates that torcs continued in circulation until the mid-1st century BC, but may have been much more scarce or absent after this, by which time torcs had been largely replaced by coins in precious metal

deposits (Hutcheson 2007). Both hoards containing multi-strand torcs and those with tubular torcs have produced similar deposition dates. In addition, hoards such as Hoard F contained fragments of both types, suggesting that in deposition, and therefore probably use, the two groups overlap. With so few known examples, and the great challenges posed by the lack of good contextual evidence, it is impossible to determine which (if either) came first, although the evidence amassed in Chapter 20 could indicate that multi-strand torcs were possibly made first and probably, on average, had longer use-lives than the more fragile tubular torcs, particularly those with large bodies. As is indicated by the radiocarbon dates from Snettisham, many of the multi-strand torcs could have been in circulation for centuries prior to deposition and patterns of wear suggest that some were already quite old when they were put in the ground. Stylistic dating of the decorated terminals of the 'Grotesque Torc' L.19a places its manufacture sometime in the 3rd century BC (Ch. 21). Along with the early radiocarbon dates from Hoards F and L, this implies a fairly long duration for the production of East Anglian multi-strand torcs, probably running from at least the 3rd to 1st centuries BC. At least some torcs apparently remained in use and circulation for long periods of time, perhaps even hundreds of years. Owing to a lack of good contextual information for the West Midlands group of torcs, it is not possible at present to comment definitively on how the two regional groups interrelated: whether they were contemporary, overlapped one another, or one followed the other. The discovery of a torc hoard at Leekfrith, Staffordshire, containing a torc closely resembling an example from the well-known 3rd-century continental grave at Waldalgesheim (Farley *et al.* 2018), suggests the West Midlands tradition is at least as old as that in East Anglia, if not older.

Iron and copper alloy torcs are known from 1st-century AD contexts (Polden Hills, Upchurch), and copper alloy Wraxall-type collars and beaded types also date to this period. This (as well as continued references in texts such as Dio Cassius's description of Boudica) suggests that the idea of the metal neck-ring as ornament probably persisted, at least in some regions and contexts, but that after the 1st century BC both styles and materials changed. In particular, no gold or silver alloy torcs can be securely ascribed a 1st-century AD or later date.

Interpreting torcs

As we have seen, much is known about torcs in terms of their chronology and distribution, but there has been less work examining how they were worn, how they felt and what effects they had on the wearer and social relations (cf. Entwistle 2000, 10). In this section we will consider these aspects in detail. Also, following comments made by Elizabeth Foulds in her examination of glass beads, we will also examine how torcs related to the socially constructed body, and how they were used to build dress and identity (Foulds 2017, 20).

How torcs have been interpreted

Personal adornment has for some time been a focus in Iron Age studies (e.g. Hill 1997; Jundi and Hill 1998; Giles 2012; Adams 2014; Foulds 2017). For example, J.D. Hill (1997) cited the presence of cosmetic sets in Late Iron Age contexts in southern Britain as evidence for increasing concerns over personal appearance and individual identity. Melanie Giles (2012, 121) also highlighted the effects of wearing objects such as brooches. But for the most part, many items of adornment have simply been viewed as passively representing the status of their wearer or other forms of identity. There are also issues with the 'common-sense' attribution of material culture types to gender, particularly the uncritical dismissal of some dress items simply as 'female costume' or 'jewellery', with no thought as to what these artefacts can tell us about identity and how it was performed (cf. Pope and Ralston 2011; Giles 2012).

For the most part, the interpretation of torcs mirrors these general patterns in Iron Age studies. In many previous and current interpretations, both the torc and the human body are passive. The torc is seen to be representational of the status of its wearer but the body is also inscriptive: a skin for public display of the identity or status of the individual within (cf. Joyce 2005). An example of this can be seen in an illustration in Simon James's (1993) book *Exploring the World of the Celts*, which shows a 'generalised structure of a Celtic community' (**Fig. 22.6**). It neatly exemplifies the traditional view of how Iron Age or 'Celtic' societies were structured, headed by a chief with his retinue of warriors. Just below this 'aristocracy' are the craftsmen, bards, and Druids with everyone else at the bottom. The chief is shown wearing a large torc. Behind him, bards, warriors, and Druids are depicted wearing less ostentatious examples. The people at the back – the rest of society – do not wear torcs. James's illustration neatly summarises how torcs and other valuables have traditionally been interpreted: as the preserve of power and nobility, the object passively denoting chiefly authority, or other high social status and position. The individuals shown wearing torcs are also exclusively male. As noted by Pope and Ralston (2011, 376), when women are associated with torcs (for example when the connection cannot be ignored because they are found in a female grave), until relatively recently they were rarely interpreted as symbols of power, but rather as items of jewellery or costume perhaps denoting marital or maternal status.

Hill has questioned whether a torc necessarily represented the status of an elite individual: 'a gold torc may not have been an "elite" object (i.e. an object whose ownership and use defined the wearer as a member of an elite status group) in terms of showing off the individual's wealth and power. Rather it may have symbolised the status and power of the larger group that the wearer represented – a symbol of office not a personal status item' (Hill 2011, 256). Similarly, Creighton (2000) viewed torcs as 'insignias of office'. This reinterpretation fits better with our understanding of society in Iron Age Norfolk at the time torcs were in circulation, whereby it is likely that status was achieved rather than hereditary (Ch. 23), and power structures may well have been fluid and heterarchical, rather than fixed hierarchies (see Joy in Baldwin and Joy 2017). This does not mean torcs were not active in negotiations of status between individuals and groups, rather that they played a dynamic role in these negotiations depending on where and how they were worn, exchanged and handled.

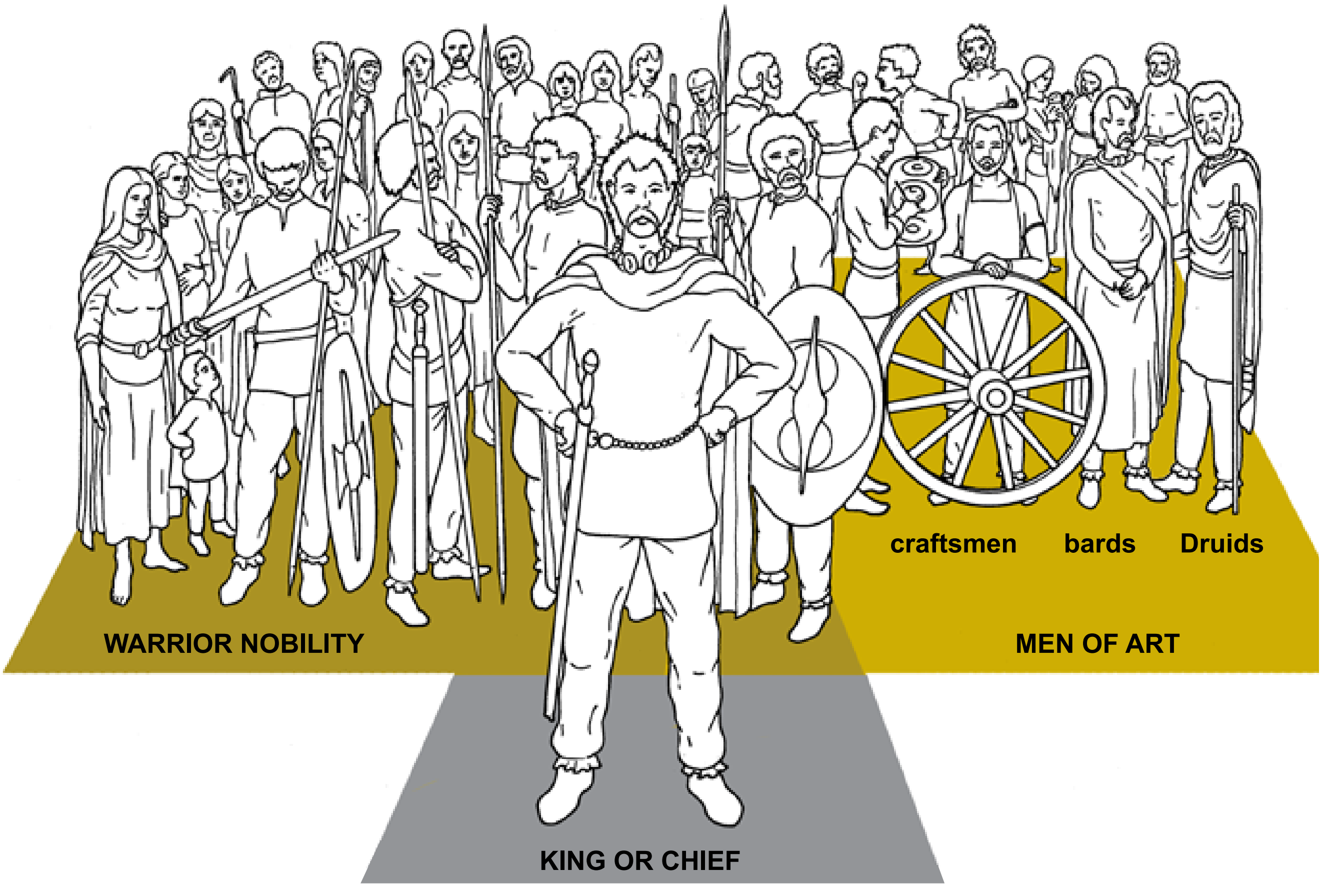


Figure 22.6 Simon James's (1993) depiction of the traditional model of Celtic society, a conception which has since been widely debated, not least by James himself (image © Simon James)

Sharples (2007; 2010) has highlighted the role objects play in 'creating a community'. He argued that they achieve this 'by establishing relationships between individuals and mediating relationships between groups' (Sharples 2010, 92). This can be accomplished, for example, by gift giving, which can act to construct or cement relationships as well as creating social obligations. Objects continue to build relationships throughout their lives until they are eventually disposed of. As already outlined, Hunter (2006) speculated that so-called massive armlets may have been exchanged as gifts, whether diplomatic, a form of bride wealth, or to pay other social debts and obligations. Torcs similarly would have made spectacular gifts. Indeed, two torcs which show close similarities, both to each other (Machling and Williamson 2018) and finds from East Anglia, were found much further north, suggesting they may have travelled through trade and exchange to their eventual sites of deposition. The Newark Torc was found in Nottinghamshire, some distance from Norfolk and located on the other side of the Wash, while the Netherurd torus terminal was recovered in eastern Scotland. As well as its close similarities to finds from further south, the Netherurd terminal is decorated with 'basket-weave' hatching, a stylistic element otherwise confined to southern Britain. Whilst Machling and Williamson (2018) have argued for a northern origin for the Newark and Netherurd torcs, both could just as easily be interpreted as objects made in or around eastern England which changed hands to move north as gifts or through trade.

Owing to the fact that many torcs are highly decorated, they have also been valued in academic discourse as art objects (e.g. Jope 2000). This could be seen to transform them into a fetish: discussions debate in exquisite detail the date and techniques of manufacture, as well as stylistic parallels, but they do not tell us how the objects were worn, how they felt and moved on the body (cf. Entwistle 2000, 10). What is missing from these interpretations of torcs is a consideration of their 'lived' performance: a view of the person and the body as a whole. How did the body and torc interact? How did one affect the other when they were worn as opposed to being handled? Visual qualities are often given preference (Joyce 2005, 148), but what did it feel like to wear a torc? The neck-ring and terminal decoration are highly tactile. How did torcs affect memory? Could their decorations have wider significance, perhaps related to 'special' knowledge? What about their links to people who had worn them in the past? How were they worn? Over clothing or directly on the skin? What about the temperature of the object or its weight? Were they noticeable when worn or did this change over time as the body became accustomed to wearing one? What about their effect on the body? How did they affect posture and movement?

Rethinking torcs

Who wore torcs?

As is illustrated in **Figure 22.7** (see also **Fig. 13.1**), the torcs from Snettisham vary a great deal in size, although the vast majority would comfortably fit an adult neck. The massive silver-coloured torc from Hoard G (G.11) weighs over 2kg and has an internal circumference of around 544mm. It is

Figure 22.7 Image showing a range of objects of different sizes, from small bracelets to the largest torcs, reproduced at the same scale for comparison (compare with Figure 13.1)

difficult to equate the size of people in the past to those today, but this circumference is larger than most available male shirt collar sizes today (a size 4X fits a neck circumference of *c.* 500mm, *c.* 19.5 inches). The torc with the largest internal circumference is D.1a, at 568mm. These large sizes may be misleading, as torcs often have their terminals pulled apart. Most could of course have been squeezed more tightly closed to fit a smaller neck, though G.11 is too robust to bend in this way, and so would also have required its wide neck opening to take it on and off.

At the other end of the scale, of those items classified as 'torcs' in the catalogue (so excluding the smaller objects which have been classified as 'bracelets', see Ch. 13), the three smallest torcs (B/C.47–8, F.116 and G.14) have internal circumferences of around 280mm (11 inches), which would be on the small side for an adult. These could have been worn at the neck by an adolescent or child, although if this is the case, this evidence works against the argument that torcs were markers of achieved or ascribed rather than hereditary status. Alternatively, these small torcs could conceivably have been worn elsewhere on the body, such as the upper arm.

Aside from these small torcs and the four clear examples of multi-strand bracelets, 54 torcs are complete enough to allow measurement of their internal circumference. When looking at the overall distribution of measurements (see **Fig. 13.1**), the greatest frequency of circumferences (30 examples, or around 56% of the torcs) cluster between 400 and 500mm (15.5 to 19.5 inches). This range falls within modern-day men's collar sizes. Thirteen torcs (24%) have internal circumferences under 400mm (*c.* 15.5 inches). Many of those fall into the range of roughly 340–390mm (13.9 to 15.5 inches), in keeping with modern women's collar sizes. Some caution should be exercised here as people today are probably bigger and on average heavier than in the past, and of course it may have been desirable for a torc to sit differently on the neck, perhaps much lower than a modern shirt collar. Nevertheless, these measurements do provide some indication that the Snettisham torcs could have been worn by both women and men and possibly even (in rare cases) by children and adolescents. This conclusion is supported by evidence from continental Europe where, as we have seen, torcs are found in the graves, chiefly of women, but also children and the elderly. Hoard G contains torcs running from almost the smallest (G.14) to the largest sizes (G.11), and other large hoards such as L also show wide variation. This emphasises that these groups of objects collected together for deposition had probably been made for and worn by a wide variety of individuals or roles.

Ornaments and the body: Wider scholarship

> Some of the key generative structuring principles of identity, or the repeated, habitual actions from which identity emerges, lie in how people choose to wear garments or ornaments, how this material culture shapes and gives meaning to the body and how clothing influences or inspires particular movements and gestures (Martin 2014, 28).

The focus on bodily adornment and dress in Iron Age studies reflect wider discussions of the body and personhood in archaeological discourse (e.g. Borić and Robb 2008a; Thomas 2002; Harris and Robb 2013a; Fowler 2004; Sofaer 2006; Stig Sørensen and Rebay-Salisbury 2013; Rebay-Salisbury 2016; Martin and Weetch 2017). This is in part a reaction to discussions of the human body focusing on bodily symbolism and metaphors (Hamilakis 2002a, 99; Hamilakis *et al.* 2002a, 11–12), where dress is viewed as a symbolic means of non-verbal communication, denoting specific categories such as status, age, ethnicity and gender (Joyce 2005, 142–3). 'Archaeologies of the body' have been informed by a number of different thinkers (see Borić and Robb 2008b, 2–5), from Giddens (1979) and Bourdieu (1977), who highlighted the difference between modern and pre-modern societies, to work in ethnography and anthropology where different ideas of the self are presented, such as 'fractal', 'dividual' and 'extended' personhood (e.g. Strathern 1990; Wagner 1991; Busby 1997; Gell 1998; LiPuma 1998). Foucault's (1988) ideas of the body as a means of social control and appropriate conduct in terms of 'techniques of the self', as well as Mauss's (1973 [1934]) notion of 'techniques of the body' have been influential (e.g. Treherne 1995; Hill 1997). There has also been a focus on embodiment (Csordas 1994; Hamilakis 2002b) motivated in part by phenomenology, but also the performative and gender theory of Judith Butler (1990; 1993) and Elizabeth Grosz (1994). Finally, the 'Perspectivism' of Amazonian ethnographers such as Viveiros de Castro (1992; 1998), which highlights the instability of bodies through varying relations between humans and non-humans, has become increasingly prevalent.

Overall, one of the main outcomes of all this work has been an acceptance that the body is not a biological universal, but rather, it is a culturally variable entity. In other words, culture is not spread over the surface of a biological body which exists outside of it (Turner 1980, 112; Csordas 1994, 1; Thomas 2002, 31) and there is no template like the individual which transcends human experience (Fowler 2002, 63). Even within individual societies, several contradictory ways of looking at the body can simultaneously be held (Harris and Robb 2013b, 20).

Personhood is something which one does rather than something one has (Thomas 2002, 36). Of particular relevance to this discussion is a focus on the relationships between the body and the rest of the material world (Morris and Peatfield 2002). Prehistorians like Fowler (2002) have convincingly argued that bodies in the past were not necessarily like us, in particular that the body and the material world were not always separated in the same way (Fowler 2002, 47; Hamilakis 2002b, 125). Similarly, Thomas stated, 'I argue that people's bodies in some prehistoric contexts may have involved non-human elements…' (Thomas 2002, 50). The social body therefore may extend outside of the biological body through relationships with others and with objects (Fowler 2008, 47).

In the following account, two components of these discussions are particularly influential. First, we advocate a 'flatter' ontology between humans and non-humans and reject the unquestioned projection of the Western autonomous individual into narratives of the past. For example, when an Awá man from Amazonia makes arrows, this is not only done so that he can hunt (González-Ruibal *et al.* 2011). Making an arrow is part of what it means to be a man in Awá society. If you do not make arrows you are not an 'Awá man'. This rejection of Western individualism does not imply that people in the past were 'faceless' and 'unthinking', or that everyone was equal. As Thomas (2002) expressed it, 'instead, it means that we recognise that people are different by virtue of their differential positioning within the networks of power and knowledge. We are not free to be what we will, but we realise our potentials differently because of our opportunities, experiences, access to knowledge… and because we may have been excluded, dominated or oppressed by others' (Thomas 2002, 38).

Secondly, Strathern's (1990) notion of the socially constituted body, viewed as the sum of the relations in which it participates, is seen as especially important. As Harris and Robb (2013b) neatly expressed it discussing bodily ornamentation in New Guinea, 'colourful body ornaments, often including traded or gifted items such as arm shells, are a way of displaying the sum of relationships making up the body' (Harris and Robb 2013b). How closely objects were 'linked' to the human body is dependent on the strength of both physical and relational attachments. As Harris *et al.* (2013, 81–2) noted, some types of prehistoric bracelets and anklets have no obvious attachment and may have been put on at a young age and 'grown into', becoming a part of the body. Others were put on and removed depending on occasion and context.

Ornaments also have their own biographies, comprising the sum of the relationships they have been a part of throughout their lifetimes (Joy 2009a). For example, Turner (1980, 118) identified cylindrical lip-plugs made from ground and polished rock crystal as being particularly important in Kayapo groups living in the Amazon Basin. Much time and labour were invested in their manufacture and they were passed down the generations, acting as family heirlooms. Their milky white colour was also associated with age and they were particularly worn by elderly men. In essence, bodies and ornaments were bound through relationships both physical and historical. Physical qualities such as material, colour and age embodied specific cultural qualities. As stated by Alfred Gell when discussing Kula valuables, 'an important arm-shell or necklace does not "stand for" someone important, in a symbolic way; to all intents and purposes it is an important person in that age, influence and something like "wisdom" inheres in its physical substance, in its smooth and patinated surfaces, just as they do in the mind and body of the man of renown to whom it was attached' (Gell 1998, 231). Object histories of exchange and gift-giving actively linked wearers to relations, creating connections with the past, present and future. Wearing an heirloom also can be seen as a form of 'inscribed' history (cf. Joyce 1998, 160). Objects of adornment therefore can, as Melanie Giles memorably expressed it, crystallise a 'social geography of relations' (Giles 2012, 154).

Turner (1980) has discussed the concept of a 'social skin'. According to Turner, as the skin is on the outside of the body, it is a part of the body that is presented to other people in relations. Since people in Melanesia are constituted by their relations with others (Strathern 1990) the person is his or her skin (Gell 1993, 24). Entwistle (2000) has also argued that '…dress is both an intimate experience of the body and a public presentation of it. Operating on the boundary between self and other is the interface between the individual and the social world, the meeting place of the private and the public' (Entwistle 2000, 7). Similarly, Borić *et al.* (2013, 37) viewed ornaments and clothing as a 'second skin' between the body and the outside world. These perspectives go some way to blurring the boundaries between the person and the outside, but they still maintain something of the Western autonomous individual as the exterior social skin creates an artificial distinction between what is on the surface and what lies beneath (Joyce 2005, 145). Alfred Gell's (1993, 38) notion of 'artefactual skin' comes closer to what we want to argue for here. Describing tattooing in Polynesia he explained, 'one can understand this as a process of involution, the creation of an extra layer by folding the skin over upon itself, making an inside of an outside and an outside of an inside' (Gell 1993, 39). This 'folding over' encompasses or wraps up many different relations in the presentation of the social person but is also transformative. Viveiros de Castro (1998, 482) also demonstrated the transformative qualities of animal masks in Amerindian societies. The purpose of animal masks was not to conceal the human identity of its wearer. Rather, through the performance of wearing a mask in the appropriate context, it possessed the power to transform its wearer.

From this brief examination of the wider literature, it is clear that objects of adornment are not straightforward reflections of identity; they are active in creating it (Fisher and Di Paolo Loren 2003, 226). Identity is performed and is dependent on context and the perceptions of the viewer. Performance is therefore of particular significance (e.g. Inomata and Coben 2006a) and will also form a focus of our discussion. Objects of adornment are more than a costume or a prop, rather they are a part of an embodied person (Meskell and Joyce 2003, 10). In the words of Malafouris (2008, 116), they transform and extend the boundaries of our

'body schema'. People and dress interact through use and movement, creating different effects, both on the wearer and observers. For example, Jones (2007, 11) has used the idea of 'body memory' to describe a process by which memory is 'sedimented' through bodily movement.

Here we also take inspiration from the evocative descriptions of Iron Age dress described by Melanie Giles (2012) in her book *A Forged Glamour*. For example, describing an amber bead and several rings made of jet and copper alloy found at the neck of a woman buried in the Kirkburn cemetery, East Yorkshire, Giles stated, 'in life, as someone moved, these ear-pendants, hair loops or necklace charms may have clanked softly together: impressive flashes of light reflecting off their polished surfaces in contrasting warm and dark colours' (Giles 2012, 121).

How torcs were worn

Torcs were worn at the neck with the terminals facing forwards. Evidence from wear and repair (Ch. 20) suggests that torcs were put on by widening the gap between the terminals sufficiently to fit around the wearer's neck. This was achieved by lifting and pulling one terminal slightly, creating tension at the back of the neck-ring and pulling one terminal further forward than the other. Some torcs would have sprung back into shape once fitted around the neck, others with stiffer neck-rings would have needed to be squeezed closed, or those too thick and inflexible to bend (e.g. G.11) would have been worn with a wider opening at the front. Tubular torcs were probably secured around the neck by some form of locking device positioned at the back.

Over time, as torcs were worn, contact with skin or clothing caused polishing on the terminals. Some torcs (such as the examples from Newark and Leekfrith) have polishing on one side only, suggesting they were worn one preferred way up. This could have been related to how decoration was designed to be viewed, or perhaps each of these torcs was worn by just one person over an extended period of time. Other examples, including those from Snettisham, do not show this consistency of polishing on the terminals, implying that there was not a 'correct' way up to wear them.

The necessary movements required to manipulate the torc around the neck would have required some practice but would have soon become second nature. It is difficult to determine whether torcs were worn directly on the skin or over clothing. If they were in contact with the body, then the metal may initially have felt cold to the skin until it was sufficiently warmed by body heat. Much like wearing a heavy watch, it might have taken some time to become accustomed to the weight of a torc. The notion of an item of dress becoming so familiar it almost forms a part of the body is interesting in the case of torcs as it is likely that even though it took a while to adjust to wearing one, it would eventually have become second nature. In addition to the weight, how the torc sat on the neck would also affect comfort. The position of the terminals in relation to the collar bone, for example, could cause pain or irritation, especially if the terminals lay directly over the bone.

In addition to the objects themselves, evidence for how torcs were worn can be gleaned from depictions on Iron Age artwork and classical representations of Iron Age peoples (Eluère 1987). Well-known examples include: the stone statue dating to the second half of the 6th century BC from Hirschlanden, Baden-Württemberg, Germany; the 5th-century BC sandstone figure of a warrior from the Glauberg, Hesse, Germany; the Ragstone head from Mšecké Žehrovice, near Prague, Czech Republic, dating to the 2nd century BC, depicting a moustachioed male wearing a buffer terminal torc; the 'Dying Gaul', a Roman marble copy of a late 3rd-century BC statue from the sanctuary of Athena Nikephoros, Pergamon, western Turkey; the cast sheet bronze statue with one surviving blue and white glass eye from Bouray, France dating to the 1st centuries BC/AD; the wooden carving of a woman wearing a buffer terminal neck-ring from Sources des Roches, France; and, perhaps best known, the cross-legged, horned figure wearing a torc and holding another in his right hand depicted on the silver cauldron from Gundestrup, Denmark. People only rarely appear in Iron Age art (Joy 2011). Where they do, often only the head or face is shown, and it is also debatable whether they are depictions of individuals or, rather, heroes and deities. We should probably not view these images as 'windows on the past' as they create an ideal of bodily adornment and identity rather than a precise representation of day-to-day dress (cf. Fisher and Di Paolo Loren 2003, 227). They may have served as 'citations' for lived performances (Bachand *et al.* 2003, 238–9), but unlike societies where human sculpture was pervasive, unless there were images made of perishable materials such as wood which no longer survive, few people in the Iron Age would have had the opportunity to compare themselves to these idealised images. Rather, people learned through experience the appropriate ways and contexts in which items of adornment were worn and by whom. Nevertheless, in all of these representations the torc is worn at the neck with the terminals positioned facing forwards, sitting on the clavicle. This detail is corroborated by evidence for the wear and repair discussed elsewhere (Ch. 20).

The individuals wearing a torc in classical images such as the Dying Gaul are naked, but this is likely associated with classical notions of beauty, and the idea of the 'noble' barbarian (e.g. Williams 2001, 90). The association between torcs and people from temperate Europe in the minds of peopIe from the classical world can be described as a stereotype, in that it must have simplified reality (otherwise we would likely find many more torcs). It also allowed classical people to make sense of the 'other'. As Bailey (2008, 12) observed, 'stereotypes are especially potent for understanding the relationships among different groups of people'. In the classical world in particular, it was taken for granted that the northern barbarians wore torcs and this perspective was widely held. It is a particularly powerful stereotype because torcs transform the body (cf. Bailey 2008, 13), promoting the difference between 'us' and 'them'.

It is not certain how uncomfortable torcs, especially heavy examples, were to wear for long periods. Anecdotal evidence from people today who wear replica torcs suggests they are perfectly comfortable (Durman pers. comm. 2016). Similarly, some people wear replicas over clothing whereas others prefer to wear them underneath their clothes directly touching the skin. Owing to the fact that many Iron Age

depictions show only the head and torc, it is hard to determine what sort of clothing, if any, was worn on the upper body.

Modern Western ideas of comfort may also not be wholly relevant when considering Iron Age torcs. Considerable discomfort is often endured through bodily adornment in other cultures, through practices such as tattooing, scarification and dental modification (cf. Joyce 1998, 159). In her survey of the significance of copper in Africa, Eugenia Herbert (1984) made several interesting observations concerning copper ornaments. She argued that they were almost universal in African societies and 'copper adorned the human body from head to foot and laterally to the tips of the fingers: hair ornaments, earrings, collars and necklaces, pendants, girdles and cache-sexes, bracelets, anklets, rings, bells, amulets, crowns' (Herbert 1984, 210). Surveying notes from ethnographers and travellers, one aspect of these ornaments that was particularly striking was their size (*ibid.*, 213–14). For example, late in the 16th century Paludanus noted that the women at Cape Lopez, Gabon wore metal rings weighing 'three or four pounds'. Similarly, in modern-day Zambia during the 19th century Du Chaillu claimed Mpongwe women wore ornaments weighing up to 25 to 30 pounds on each ankle. But these heavy ornaments were not confined to the legs and ankles. In the middle Congo, Bentley and Johnston observed Bobangi people wearing collars weighing from 20 to 30 pounds. Coquilhat claimed that collars he found at Wangata weighed an eye-watering 15 to 25 kilograms, remarking '…the well-turned woman of the world wears day and night a weight equal to the pack of a Belgian infantryman in the field' (quoted in Herbert 1984, 214). And neither could some collars be easily put on and taken off. They were fitted by blacksmiths and the wearer had to lie on the floor, with one end of the collar resting on an anvil. To remove it, the ends had to be forced apart using a metal wedge (*ibid.*). Herbert (1984, 214–16) also noted just how great the variety of ornaments could be even within a single group. For example, she cited Gutersohn's observations of the Mongo who noted that a single local smith produced eight different types of bracelets, collars and leglets. These ranged from a 10kg neck-ring to spiral-shaped leg rings covering all of the lower leg. Even where individual items were not as big, many smaller artefacts could be worn together with equally staggering combined weights. For example, in Burundi bracelets each weighing 5½ pounds were worn three or four to an arm (*ibid.*, 216).

A further factor to consider is how wearing a torc potentially affected the movement of the wearer. Although torcs are heavy, because they are not fixed tightly around the neck they may have moved around. This would not be a problem when the person was walking, but if worn when running, the terminals would have bounced up and down, potentially hitting the face of the wearer and also bruising the skin around the collar bone if it was worn directly over the body. This could have been mitigated by tucking the terminals under clothing but then the visual impact of the object would have been severely affected.

In terms of deportment, wearing a torc could have also influenced posture. This at first seems strange, but even today objects restrict movement and affect posture. An obvious example is the stiletto shoe, which changes how a person walks and can be painful to wear. To prevent a torc from moving, or perhaps to display it to its best effect (cf. Martin 2014), its wearer may have subconsciously adjusted their gait and straightened their backs. Given that, as Melanie Giles (2012) has shown, many Iron Age artefacts were brought to life through movement, the particular qualities of the torc combined, transforming the body by promoting an erect posture and slowing movements. Torc wearers therefore may have possessed a certain bearing which was ascribed social significance.

In terms of the viewer, a large gold torc with decorated terminals would clearly have been more obvious to the casual observer than a small copper alloy example. Either way, their position on the neck makes them particularly conspicuous. When people interact, often the first thing they do is look at each other's faces. The torc acts to frame the face. The prominent terminals accentuate this effect, drawing the eye away from the face to the chest and back again. It is thought that the head held a special significance to Iron Age people. As the most recognisable part of the human body, it provided a focus for ritual practice (Armit 2012, 224).

Interacting with torcs could also be a sensory experience for the viewer. Raised decoration, the complex twists of wire neck-rings, and the shiny golden or silvery colour of most examples would have created different experiences depending on levels of closeness and access. Viewed from afar, a torc may have only been glimpsed at the neck as a golden band, or a facet of the raised decoration on a terminal might be seen when it caught the sun or flickering firelight. Close-up, details of the decoration could be deciphered, holding the eye and leading it in different directions. The attention of the viewer may also have been captured (cf. Giles 2008), attempting to unravel in their minds the intricacies of the twists of the neck-ring. Touching the raised decoration and textured hatching of the terminals and the uneven but smooth surfaces of the ropes and wires of the neck-ring would have provided an additional sensory experience. Just as Giles (2012, 121) posited the soft clanking of metal pendants and earrings, so some composite objects from Snettisham (such as D.1, G.5, and the 'Grotesque Torc', L.19) would have carried a particular soundscape with them as the wearer moved: the soft chink of metal against metal and the scrape of shifting wires.

Harris and Robb (2013a, 3) introduced the concept of the 'body world', and suggested examining the bodily experiences and representations of a specific place and time. They cited for example the Mesolithic period, where dogs were buried like people and sculptures were carved showing humans transforming into fish (Harris and Robb 2013a, 3). Torcs existed in a particular body world. There are many clues in the archaeological record that Iron Age people did not conceive of the relationships between humans, animals and objects in the same ways we do today. For example, bits of bodies were placed in pits alongside objects and animal bones, suggesting that, in deposition at least, all three could become potent and symbolically charged (Hill 1995). Similarly, the full human form was rarely depicted in art, being rejected in favour of deities, or half-human, half-

animal forms. Heads were favoured, some shown wearing torcs. The seemingly abstract, ambiguous art styles also make allusions to faces and animals, but they often remain concealed or half glimpsed (Megaw 1970). This 'body world' is transformative, with no hard and fast distinctions or fixed relationships between people, animals, and objects.

A final consideration concerns not only how torcs were worn on the body but also how they were combined with other items such as bracelets and rings as a costume. One of the ways archaeologists have studied bodies and their relationships with objects of adornment has been through analysis of their position in relation to the human body in graves (e.g. Stig Sørensen 1997; Treherne 1995; Giles 2012). Unfortunately, very few torcs have been discovered in graves in Britain (see above) and Iron Age human remains are relatively rare in Norfolk (Hill 2007, 28; Tremlett 2011, 34). Davies (2008, 92–3) recorded only 14 instances from the county in which human remains had been discovered, including a single inhumation from Shouldham and four cremations from Thetford, Weeting, Heacham and Stiffkey. The inhumation at Shouldham is reported to have contained an iron sword with an anthropoid hilt (Clarke and Hawkes 1956) but otherwise associations between human remains and objects are rare. Data collected under the Norfolk National Mapping Programme, and in excavations, indicate the presence of around 30 sites across the region where a possible funerary or mortuary function could be attributed to ditched enclosures, both square and circular (Davies 2008, 93; Tremlett 2011, 34–7). Although many are likely not to be funerary, this evidence possibly indicates the presence of a widespread but sparse burial tradition, at least for a small proportion of the population (Tremlett 2011, 36). The rest of the people were disposed of in a manner which left little archaeological trace. Individual bones or bits of bodies, including skulls, have been recovered in addition to burials (Davies 2008, 92–3) leading to speculation that secondary burial rites incorporating processes such as exposure and excarnation were the dominant practices (Hill 2007, 28), although this is by no means proven. There is also the possibility that the dead were placed in rivers.

Other types of necklace

Other than torcs, most Iron Age necklaces took the form of pendants or strings of beads. Glass beads, for example, were sometimes strung as necklaces (Foulds 2017).

Where their position in the grave is well recorded, glass beads from East Yorkshire burials were found at the neck, in patterns suggesting they were probably strung on a single strand (Giles 2012, 145). These would have been obvious and dramatic items of dress. By combining beads of various colours, designs and sizes, they could also be customised. Beads could easily have been added to or removed from strings, meaning they may also have acted as adaptable and useful exchange items (*ibid.*, 149). This could have allowed beaded necklaces to change as their owner aged and took on different roles – adolescent, mother, leader, religious specialist, grandmother, elder, etc. Removing and adding beads could also facilitate and enact extended relationships.

No glass beads were recovered from Snettisham, and only two shale objects which may represent beads (SA/HC and SA/HW, see Ch. 9). The dating of these finds is uncertain, though they could in theory be Iron Age or, more likely, Romano-British or later. Both were stray finds. Nevertheless, how glass beads were worn, and how bead necklaces possibly changed over time as new beads were added and others were removed, could provide clues as to how torcs such as the Grotesque torc and other composite groups of artefacts from the Snettisham hoards could have worked in performing various changing identities.

Performing identity

As discussed above, another factor to consider is the potential transformative effect of wearing a torc. When reading ethnographies, it is hard to conceive that anyone truly believed that a person donning a mask could become an animal. When read through a Western cultural lens they can only ever be a person acting like an animal. But other societies have different ways of understanding the world, with different relations to animals and things (Harris and Robb 2013b, 12–13). Both perspectives of the masks are valid from the standpoint of different ontologies but we need to bear different possible understandings of the world in mind when examining prehistoric objects like torcs. The transformative effects of wearing a torc should not be dismissed.

Melanie Giles put this succinctly when she stated '… that identity is not something you simply "have" or "are," but is constituted through what you do in the world' (Giles 2012, 31). The same is true for objects. They are defined not by their physical attributes, but by what they do. Just as people age and their roles in society change, so too do objects. They accumulate but sometimes 'lose' biographies; their lives evolve and change as they move from context to context and gather time. The potential accumulation of biographies for torcs and composite objects at Snettisham is considered in detail in Chapter 20.

We do not know the social arenas in which torcs were worn and experienced. But, ritual performance is probably one of the contexts in which it was appropriate to wear torcs. Rituals provide an idealised version of reality which can be interpreted in different ways in different situations, mirroring but also creating social change. They can also act as a means of establishing and manipulating power relations across society (Inomata and Coben 2006a, 18–19). Objects can form important components of ritual performances, serving as containers of knowledge associated with the narrative of ritual practice and acting to physically manifest specific events or occasions (Inomata and Coben 2006a, 31; Triadan 2006, 162). As outlined above, Hill (2011) argued that torcs were not high-status objects owned by particular individuals, but communal possessions deployed in certain contexts to represent a specific social or ritual office. Given the large number of examples, it is unlikely that this interpretation could apply to all of the Snettisham torcs and many are likely to have been personal objects. But if some were communal possessions, perhaps the larger more ornate examples, this is another example of the transformative power of the torc: changing the wearer by allowing them to

step into a special role, which they perhaps then laid aside when the torc was removed. If such a role could be played by different people, then it may be that as much of the ritual power was bound up in the torc as in the practitioner. Ritual or sacred objects are rarely found at the location of these performances, but through archaeological research we can at least gain some insight concerning the final performance they were a part of, for instance the burial and placement of torcs in hoards. The acts that led up to and constituted the creation of the torc hoards are discussed in detail in Chapter 23, taking Hoard L as a case study, including an exploration of how the field systems revealed by geophysical survey (see Ch. 8) may have helped structure ritual activity and movement around the site. Whilst we do not know for certain, some of the torcs could have been old enough to have been present for earlier midden-generating activity at the site (see Ch. 7) long before they were eventually deposited.

Even if the torcs were worn in less formal contexts, wearing a large, decorated, golden-coloured torc probably generated a certain amount of attention given their likely scarcity and the investment placed in their manufacture. Ian Hodder (2006, 83) has argued that spectacle, which he defined as 'showing and looking', is a component of all societies. There is plenty of evidence for large public events in the Iron Age such as the feasting sites at Chiseldon (Baldwin and Joy 2017) and Hallaton (Score 2011), and some of the pottery evidence from Snettisham suggests that this place may also have been the site of feasts earlier in the Iron Age. Spectacle can also take place in domestic contexts (Hodder 2006, 98). According to Houston (2006, 135–6), emotions and reactions are generated through spectacle, ranging from awe and wonder to fear and revulsion. Such events also act to unify groups as well as delineate social differences. Spectacle requires an audience. Audiences judge whether a performance is conducted correctly. Each participant brings their own level of knowledge and understanding to a performance. Describing the Katsina society of south-west North America, Daniela Triadan (2006, 165) described how, because masks are never removed in public, uninitiated children do not realise that some of the mask wearers are their fathers and uncles. Each of the ceremonies undertaken by the Katsina required distinct ritual paraphernalia, which was kept in their clan houses (*ibid.*, 168). Individuals charged with specific responsibilities were annually appointed. Checks and balances meant that power stayed principally within groups, rather than being in the possession of individuals (*ibid.*, 170).

The concept of 'beautification', put forward by Nancy Munn (1977, 47) to describe social practices in Gawa, and also developed by Rosemary Joyce (2000, 11) in her work on Mesoamerican performance, provides a different notion of what torcs may have 'done'. Beautification involves the deliberate increase of the sensory attraction of the body through the addition of skilfully worked artefacts. These 'draw attention' to individuals during performances resulting in what Joyce (2000, 11) termed a 'quality of renown'. In small-scale societies this can result in these individuals being perceived as more 'persuasive' or 'potent' (*ibid.*). Perhaps wearing torcs had a similar affect. In addition, could someone wearing a torc have taken on a different identity? Not just in terms of a sign of status or an insignia of office, but a transferal from a known individual to a hybrid 'torc/person', where the torc and the person become something different, able to transcend the limitations of 'normal' human interaction. This could be particularly advantageous in a world like 4th to 1st-century BC Norfolk, where most people were likely of a similar status, and many would have been known to one another.

Torcs and status

The question seems to be not 'Were torcs involved in negotiations of status and identity?', but rather, 'How?'. As we have seen, torcs were heavily used and they were objects that altered the human body when worn, not only the appearance of the wearer, but also probably their movement and posture. Torcs were therefore not passive reflections of the social standing of their wearer, they were active in negotiations of identity and status through how they were worn.

A further question is 'What kind of status are we referring to?'. Cunliffe's chiefly model of Iron Age society (see e.g. Cunliffe 1984, 559–62; 2005, 588–94) provides one possibility, with large, ostentatious torcs being the ultimate sign of chiefly authority. If this was the case, then torcs would have been active agents in creating the authority of leadership, not just a sign of authority or badge of office. Worn at special occasions, most people could only have glimpsed them from afar. Only those privileged with intimate access could fully appreciate the intricate decoration. Wearing a torc could also have affected the body, changing posture and slowing down movement. These effects might have been viewed in a positive way in terms of emphasising the authority of the wearer and their difference from others.

However, this is only one model for the organisation of Iron Age society. Ethnographic studies have shown that chiefdoms are inherently unstable and often last only a few generations (see e.g. Earle 2011). The archaeological record for the Iron Age also suggests a great chronological and geographical variety in forms of social organisation (Gwilt and Haselgrove 1997; Moore 2011; Hill 2006). This evidence combined implies that if chiefdom-like hierarchies were present during the Iron Age in Britain, which they probably were in some form or other, particularly towards the end of the period, this was not the only type of society present, and was probably not the norm. We therefore also need to look towards other forms of social organisation and means by which objects like torcs could have been made and used. As we have seen, Hill (2006; 2007) has suggested 'flatter' social hierarchies were probably present in much of Britain, with a greater emphasis on 'achieved' rather than ascribed or inherited status. Here we could see the commissioning and wearing of torcs as a form of competition between individuals and social groups such as households, worn as symbols of wealth, used in exchange and gifts, or in negotiations with the gods through their collection and deposition. Some of the more ostentatious torcs could have been reserved for community roles and positions bestowed on individuals who have attained a particular status perhaps

through their actions in the community. In terms of the organisation of metalworkers, the patronage of an elite supporting specialist metalworkers is not the only means by which complicated and ostentatious objects such as torcs could be manufactured. As has been suggested for the manufacture of cauldrons in the Middle Iron Age (Baldwin and Joy 2017), a 'ritual' mode of production is also possible. Competition between households could also support a group or groups of specialist metalworkers.

Just as modes of social organisation varied widely across time and space in Iron Age Europe so, most likely, did the role of torcs in negotiating status and identity. In some regions and periods, for example in the 5th to 4th centuries BC in western Germany, precious metal torcs are largely restricted to small numbers of richly furnished graves. In these cases, the torcs may well have been possessions of the deceased, associated with the personal power and rank of particular high-status individuals. In other regions, such as eastern France, bronze torcs appear to have been worn by a wider range of individuals, at least in death (Pope and Ralston 2011, 380), and may have been associated with performing and constructing particular aspects of identity around gender and life stage.

The evidence from Britain is very different. Whilst it is highly likely that torcs were active in the creation of status, authority, gender roles, and community identities, it is difficult to reconstruct details of such significance when precious metal torcs are found almost exclusively in hoards, and very few torcs of any kind are known from burials. Both hierarchical and more fluid or heterarchical models of social organisation could conceivably result in the evidence seen at Snettisham. Looking more broadly, Iron Age Norfolk, with its lack of burials or other signs of a distinct and fixed social hierarchy, suggests that the latter is more likely. There are few indications to support the idea of torcs as personal symbols of individual power, and indeed many objects seem to have had long lives before being deposited, suggesting that they must have been owned, used and worn by more than one person. Of course, if a richly equipped grave with the grave-occupant interred wearing a large gold torc was ever discovered it might push interpretation in another direction.

Conclusions

Lacking other sources of evidence, we must rely on the artefacts themselves. The sheer range of torcs at Snettisham hints at the importance of uniqueness in these objects, and perhaps gradations in importance or subtle variation in social cues. Spectacular objects such as the 'Great Torc' and 'Grotesque Torc' stand out in terms of their material, colour, decoration, and the technological skill inherent in their manufacture. Were these connected to the power of a particular family line, kin group or other collective entity? Could they be passed from one person or group to another, whether as gifts or social payments, by succession, the achievement of some form of ascribed status, or the taking of a particular role or office? Were torcs themselves the active agents, the possession and wearing of which brought status and rank, but only for the duration for which they were held before being passed on to another? The details may never be possible to disentangle, but wearing torcs clearly influenced the status and identity of individuals. The main argument presented here, through a detailed consideration of the artefacts themselves, is that torcs played a crucial and active role in these negotiations, rather than being passive symbols of power. The materials they were made from, their decorations, their weight and form, all influenced the ways their wearers moved and held themselves. The different surfaces of the neck-ring ropes and raised and inscribed decoration on the terminals created varying ways in which they could be experienced from near and far. All of these different attributes meant that the person wearing a torc was not quite the same person without it. These objects effected 'spectacle' and 'beautification' and we cannot understand them fully without taking this perspective into account.

Of course, torcs without people become something different again. Perhaps, memory of the people who wore them and the ceremonies and events of which they were a part were preserved and this is why they were selected for deposition at Snettisham. In the next chapter we consider the hoards themselves, with a focus on the idea of a shift in Late Iron Age Norfolk from a 'world of torcs' to a 'world of coins'.

Gazetteer of other Torcs from Britain

The following list is largely limited to torcs and bracelets of the types found at Snettisham (multi-strand and tubular), though it also includes unusual copper alloy and iron torcs, and those with beaded and thistle terminals. Distinct groups which are discussed in detail elsewhere in the literature are not included here, including ribbon torcs, Wraxall-type collars, Baldock-tradition torcs and beaded torcs (see above). The Winchester necklaces (Hill *et al.* 2004), which are very different in construction, have also been omitted.

This Gazetteer is a significantly expanded version of a preliminary list compiled by Ian Stead. It uses the same typology as devised for the Snettisham finds; see Chapter 13 for a full discussion. Direction of twist for multi-strand torcs, where known, is only given for pieces which have a Z-twist element; otherwise the direction should be assumed to be S. The Gazetteer is divided into three parts:

- Well-recorded torcs of known type and known location
- Torcs of unknown type and/or location
- Unprovenanced torcs, possibly from Britain.

To aid finding objects from specific regions, each section is ordered alphabetically by county and then by findspot name where there is more than one discovery from a single county. Torcs falling into the first category, and the better recorded finds from the second category, are summarised in **Table 22.1**, where they appear in the same order that they are listed here.

Well-recorded torcs of known type

1. Stirling area Hoard, central Scotland

Location: National Museum of Scotland

Discovered by a metal-detector user on 28 September 2009, the hoard was formed of five fragments originating from four torcs:

1. Gold/silver alloy multi-strand torc of highly unusual construction. The core of the neck-ring is formed of a bar with square cross-section. Numerous twisted wires are wrapped and coiled around the bar. The terminals are solid loops or rings adorned with decorative wirework and granulation. A chain and hook links the terminals.
2. Two joining fragments making up roughly half of a tubular hinged annular torc of a type known from south-west France. The fragments are formed of multiple lobes of folded sheet arranged in three rows.
3. Ribbon torc with disc terminals.
4. Ribbon torc with knobbed terminals.

Subsequent excavation of the findspot revealed a small pit. No traces of any container were found. Like the hoard from Netherurd, Peeblesshire, the composition of this one is unusual and mixes artefact types from a number of different regions or at least with diverse influences, even if they are of local manufacture. The ribbon torcs are local to the region. Hinged annular torcs are known from south-west France. The looped terminal torc shares similarities with examples from Snettisham but the employment of unusual decorative techniques such as granulation perhaps also hints at Mediterranean influence (Hunter 2010; Joy 2015, 153–4), as with the torcs from near Winchester, Hampshire (cf. Hill *et al.* 2004). The hoard likely dates from 300–50 BC (Hunter 2010).

2. Hengistbury Head, Dorset

Location: Hinton Admiral; No. 1 on loan to the British Museum from the Society of Antiquaries

Fragments of at least three gold/silver alloy multi-strand torcs/bracelets were found alongside a large number of coins at 'Site 33' at Hengistbury Head during excavations carried out in 1911–12 (Bushe-Fox 1915, 24–6; Cunliffe 1987, 156–7). The area also produced metalworking debris, including evidence for hearths and large lumps of copper and silver alloys (Bushe-Fox 1915, 24–6, 72–4). Bushe-Fox proposed that Site 33 might have been a structure, though the evidence for this is slight. Cunliffe (1987, 75) interpreted it as an area of metallurgical activity. It is difficult to date precisely because the coins have a wide chronological range, spanning from around 100 BC to the 2nd century AD (Cunliffe 1987, 136–41), but Cunliffe (*ibid.*, 75) preferred a date range of *c.* 50 BC–AD 50 for the activity at Site 33. The coins were spread over a large area, mainly to the south of the site and may have been disturbed by rabbits. Despite this, Bushe-Fox (1915, 24–6) uncovered evidence for distinct concentrations of coins (hoards?), which may have been wrapped before they were deposited. For example, 734 coins were found 'lying on a stone with two stones either side'. A 'cylindrical mass of 281 coins' was also uncovered. In addition to the coins, a large block of copper/silver alloy metal was also discovered (Gowland in Bushe-Fox 1915, 73). The torc and related fragments include the cast terminal from multi-strand gold/silver/copper alloy torc (1), a complete gold/silver alloy multi-strand bracelet (2), and fragments from a gold/silver alloy multi-strand torc with buffer terminal (3–4). Nos 2–4 were found wrapped together as a composite group (Bushe-Fox 1915, pl. IX.3). A fragment of gold ribbon/strip now kept with the two torc fragments (Cunliffe 1987, 156, no. 95, ill. 113), possibly represents the objects described by Bushe-Fox as 'pieces of gold wire' found at location 'M' at Site 33, 25ft (7.6m) north of the other torc fragments (Bushe-Fox 1915, 26, fig. 17).

1. Cast torus torc terminal found by Bushe-Fox at Site 33 (Bushe-Fox 1915, 26, pl. XXX; Clarke 1951a, 60; 1954, pl. XVII.7–8; Cunliffe 1987, 153, pl. 111, no. 49; Hautenauve 2005, 235, no. 140). The terminal was originally described as a 'silvered linchpin head' by Bushe-Fox (1915, 26) but was re-identified as a torc terminal by Clarke (1951a, 60). The metal is described by Northover (in Cunliffe 1987, 186) as silver/gold plate over a probable leaded copper alloy core. The terminal is decorated with nine raised pellets and incised lines that follow the form of the terminal. Clarke (1951a, 60) examined the socket of the terminal and found the remains of 18 wires arranged in a circle cast onto the inside edge of the socket. These wires had been sheared off, but suggest an original coiled multi-strand neck-ring construction.
2. Gold/silver alloy multi-strand bracelet, found at Site 33 (Bushe-Fox 1915, 26, pl. IX; Cunliffe 1987, 156, no. 95; pl. 113). The torc/bracelet was originally twisted around 3 and 4 but this arrangement was subsequently unravelled (Bushe-Fox 1915, pl. IX). The neck-ring was described by Cunliffe (1987, 156) as being 'composed of three plaited rods'. From the photographs, however, it looks to be a Stage III construction of two ropes plied together Z-twist, each rope formed of two circular section wires plied together S-twist: (2PZ(2P))R. It is the mix of twist directions which creates the impression of a braided structure. One of the terminals is a simple double loop formed from the body of the bracelet looped around on itself. Unusually, the ply twist of the wires continues into the terminal itself. The other is a ring terminal, described by Cunliffe as '… a rough solid disc created by beating the loose ends of the rods into a single mass' (Cunliffe 1987, 156), although it appears that additional metal may also have been added to thicken the ring and cover the wires, as seen on many of the ring terminal torcs at Snettisham. There are several broken wires in the body of the bracelet. The unusual and mismatched terminals suggest that either the bracelet was unfinished, or perhaps it had been repaired and what remains is an attempt to make a smaller object out of one which was originally larger.
3. Fragment of gold/silver alloy multi-strand torc, comprising a single buffer terminal and a fragment of the neck-ring (Cunliffe 1987, 156–7, no. 94; Hautenauve 2005, 235, no. 141). The neck-ring is formed of six twisted wires, formed into a spiral and hollow in the centre: (6C)T. Three of the twisted wires have become detached since discovery (see Cunliffe 1987, pl. 113). Cunliffe (1987, 156) stated that the ends of the neck-ring wires had been roughly cut, providing probable evidence for deliberate breakage prior to deposition.
4. Comprising a twisted wire bent over to form a loop (Bushe-Fox 1915, pl. IX), this wire probably originally formed part of the neck-ring of 3. It was found wrapped together in a mass with 2 and 3.

3. Maiden Castle, Dorset

Location: Dorset County Museum

A simple one-piece copper alloy torc found at Wheeler's 'Site F', just inside the main western hillfort entrance at Maiden Castle (Wheeler 1943, 276–7, fig. 90, no. 11). Found with Early Roman material, though Wheeler interpreted it as belonging to the latest pre-Roman phase. Slightly expanded circular-section buffer terminals and narrow neck-ring made from twisted square-section wire. See similar finds from Colchester (i), Fremington Hagg, and Upchurch.

4. Spetisbury, Dorset

Location: British Museum (1862,0627.13)

Iron multi-strand torc with single-loop terminals formed from the ends of the two plied circular-section neck-ring wires: (2P)R. From the hillfort at Spetisbury Rings, Dorset. Found during the cutting of a ditch by Central Dorset Railway in 1857 and given to the British Museum by J.Y. Akerman in June 1862 (Hawkes 1940). See similar finds from Camerton, Danebury, and Ham Hill.

5. Dungyle Camp, Dumfries & Galloway

Location: National Museum of Scotland (FA96)

A small copper alloy and iron torc found before 1829 (MacGregor 1976, no. 195). Formed from two circular-section cast copper alloy rods, joined by iron pins/tenons on one section fitting into corresponding mortices/tubes on the

other. One joint is at the slightly expanded buffer terminals and the other towards the back of the neck-ring.

6. Colchester, Essex (i) (before 1870)

Location: British Museum (1870,0402.124)

Two copper alloy torc terminals of 'Gaulish type' were recorded by Smith (1905, 137, continental parallel illustrated, fig. 51, no. 10). These were acquired by the British Museum in 1870 from the Pollexfen Collection, and are reported to have been discovered at Beverley Road in Colchester. They are plain buffer terminals (each with two beaded 'collars' behind the terminal, and incised or moulded decoration between the beads). The hollow neck-ring is circular in cross-section. The closest parallels, as noted by Smith, are on the continent, but see similar finds from Britain made at: Fremington Hagg, Maiden Castle and Upchurch.

7. Colchester, Essex (ii) (1996)

Location: Colchester Museum (2021.10)

Gold alloy torc terminal discovered on 24 January 1996 by a metal detectorist, Mr Ken Kirtley, on the eastern outskirts of Colchester, at Crockleford Heath (Anon. 1996, 18). In a report written 13 February 1996 (quoted in *Treasure Hunting*, May 1996), Peter Berridge, Curator of Archaeology for Colchester Museums, described the object as a 'buffer type' terminal with 'a rectangular slot on the flat end of the terminal… which is capable of being slotted into an aperture on the other terminal'. Paul Sealey (pers. comm.) has examined the terminal and suggests that it is an unusual Gallic type, likely dating to *c.* 200–50 BC, appearing to be unfinished and unused.

8. West Tilbury, Thurrock, Essex

Location: Unknown

Supposedly discovered in or before 2000 by a farmworker 'while tractoring' (Bingley 2015, 71). The find was not officially reported and few details are known other than poor quality photographs. The neck-ring consists of three ropes and there is a repair at the back. The vase-shaped buffer terminals are decorated with raised ornament. The find has features usually seen on different styles of torc.

9. Merthyr Mawr Warren, Glamorgan

Location: National Museum Wales (29.447)

Possible fragment of gold/silver alloy multi-strand torc or bracelet (Hautenauve 2005, 237, no. 148), found at the Iron Age settlement site of Merthyr Mawr Warren. Described by Savory (1976, 67, no. 67) as a 'twisted silver wire bracelet', the fragment comprises two silver-coloured wires loosely plied together Z-twist, broken at both ends and part melted.

10. Walbrook, Greater London

Location: Museum of London (18661)

A complete one-piece penannular copper alloy torc with thistle terminals found in the River Walbrook, possibly in association with late 1st to mid-2nd-century AD Romano-British brooches (Marshall 2023). The neck-ring rod is lozenge-shaped in cross-section. Similar finds have been made in Britain at the River Medway near Aylesford and at Shenstone.

11. Danebury, Hampshire

Location: Museum of the Iron Age, Andover, Hampshire

Iron multi-strand torc with single-loop terminals and neck-ring formed from two wires or rods plied together (Sellwood 1984, 371, 2.202, fig. 7.25). Found in a cp7 context at the hillfort (this period dated by Cunliffe to *c.* 300–100/50 BC). The two terminals are joined by a linking bar of similar construction to the torc itself: an iron rod doubled back on itself to give a loop at one end (passing through one of the torc terminals), and the two strands plied together in the central section. The other end of the linking bar is broken, but would probably originally have been hooked to link into the opposite torc terminal. See similar finds from Camerton, Ham Hill and Spetisbury.

12. Whitchurch, Hampshire

Location: Unknown

A silver-alloy torc fragment consisting of two short pieces of wire forming a single strand. The fragment was snipped at both ends. The torc fragment was part of a hoard discovered by a metal-detector user in 2011 found 3–4 inches below the ground, which also included 15 other artefacts from various periods (2011T152; HAMP-8A11A7; Bliss 2020, 6, fig. 3). The manufacture of three of the objects can be dated to the Middle–Late Bronze Age: a gold lock-ring (*c.* 1000–800 BC), a gold composite ring (*c.* 1300–1100 BC) and a copper-alloy spear tip (*c.* 1500–800 BC). The remaining 13 objects including the torc fragment, a silver-alloy lump, two sections of copper-alloy binding strip probably from a shield or possibly a tankard, and a possible copper-alloy brooch fragment, all probably date to the later Iron Age (2nd or 1st centuries BC). The date of the five copper-alloy miniature axes is unclear. They could date to the Late Bronze Age or Early Iron Age or indeed be later (Bliss 2020, 11).

13. Essendon, Hertfordshire

Location: British Museum (1994,0401.1–52)

The fragmentary remains of a gold alloy tubular torc were discovered by metal detectorists in 1992 and the findspot was subsequently investigated by Ian Stead of the British Museum in 1992–4 (Stead 2006, 51; Hautenauve 2005, 234, no. 137). Tubular torc fragments, including two terminals, were discovered alongside a total of 66 coins and four ingots. It is thought the torc originated from a hoard as some of the coins were found in a terminal (unfortunately the metal detectorists did not recall which coins).

Although yet to be fully published, Stead gave a short account of the Essendon excavations in his book *British Iron Age Swords and Scabbards*:

> The remains of a gold tubular torc, one brass and three gold ingots, fragments of copper-alloy bowl and 253 British gold coins were found. Although there were distinct concentrations in the distribution of coins, indicating at least two hoards (A and B), no nucleus had survived ploughing. Another hoard (C) did have a nucleus, but instead of coins it was composed mainly of weapons … The hoard had been deposited in a shallow pool in a bog (Stead 2006, 51).

The tubular torc is plain, with a simple, hollow neck-ring and large, undecorated, bulbous terminals. Whilst the terminals are heavily damaged, what survives suggests that

the torc was probably penannular, rather than fastening to form a continuous circuit as seen in the Type 1 tubular torcs from Snettisham Hoard A. The Essendon torc does not fit neatly into the typology created for the Snettisham tubular torcs (Ch. 13), but is likely closest to Type 5.

14. Wendy, nr. Royston, Herts

Location: Royston Museum (2016.2039)

Copper alloy torc fragment comprising a section of round-sectioned neck-ring and a single beaded terminal. Found in a field wall at Wendy, Cambridgeshire. No date was recorded for the discovery. Probably 1st century AD.

15. Auldearn, Highland

Location: National Museums Scotland

Two copper alloy objects, a torus terminal multi-strand torc and a large Romano-British-style brooch, were recovered by a metal detectorist in 2014 and have since been acquired by National Museums Scotland through the Treasure Process (TT 86/14, 87/14; Hunter 2014a). The torc has a neck-ring formed from coiled copper alloy circular-section wires, alternating broad and narrow wires, and torus terminals with worn decoration including trumpet motifs. The terminals resemble triple-loop terminals, with broad outer loops and a narrow central loop, echoing the construction of the neck-ring. The style of decoration on both the torc and brooch suggest a date in the 1st or 2nd century AD. Hunter (2014a) proposed that although the closest parallels for the torc are in southern Britain, the decorative motifs suggest a local origin.

16. Aylesford, Kent

Location: Maidstone Museum

A complete penannular copper alloy torc with thistle terminals was found in the River Medway near Aylesford, Kent (Fox 1958, 66, pl. 26b; Jope 2000, 16, 234, pl. 32). The neck-ring rod is unusual in being square rather than round in cross-section. The torc belongs to Hautenauve's Type IIIa ('torque au corps massif à tampons sans fermoir') distributed from Central Europe to France with bronze examples dating from the end of the 6th century BC to the beginning of the 3rd century BC (Hautenauve 2005, 67–70). Jope (2000, 16 and 234) suggested it may have been an import but given the wide distribution of the type it is also possible that it was manufactured in Britain. Similar finds have been made in Britain at Shenstone and the River Walbrook.

17. Shepherdswell with Coldred, Kent

Location: Unknown

Short length of gold/silver alloy multi-strand torc neck-ring or bracelet body formed from two circular-section strands of wire plied together (KENT-0E7EAB, 2015 T287). The curvature of the piece strongly suggests that it was originally part of a larger Stage III plied construction: (?P(2P))R. Both ends show signs of having been chiselled, suggesting that the original object was deliberately broken up.

Non-destructive XRF analysis carried out as part of the Treasure process indicated a surface composition of approximately 56–57% gold, 35–40% silver, the rest being copper.

18. Upchurch, Kent

Location: British Museum (1894,0803.54–55)

Two torcs were found at Slay Hill Saltings on the Medway near Upchurch, Kent, now in the collections of the British Museum (Smith 1905, 138). According to the British Museum register for 1894, the four accessioned objects from Slay Hill Saltings were all discovered in an urn found in about 1864 on the Saltings west of Greenborough Marshes. These objects are an Iron Age gilded copper alloy and iron torc (1894,0803.54), the decorated buffer-shaped terminals of another (1894,0803.55), and two Roman silver finger-rings set with engraved stones (1894,0803.56–7). Coins were also found with the hoard, although these are now lost. The BM register states that the find included 'coins down to Aurelius'. The only other contemporary reference to the hoard is from Payne (1893, 75–6). He states that the jewellery was found together with silver coins of Nero (1), Vespasian (2), Domitian (1), Trajan (3), Hadrian (2), Antoninus Pius (2), Marcus Aurelius (2), Faustina Junior (2), 'and a Greek coin', and bronze coins of Pius and Crispina. The coin of Crispina is actually likely to be the latest in the hoard, fixing the date of the deposit after about AD 180. The rings are of late 2nd-century type; the intaglios represent (i) Perseus holding up the Gorgon's head, and (ii) a cock upon an ear of corn.

1. Iron rod torc, hinged at the back of the neck-ring, with copper alloy wire coiled around part of the body of the torc. Slightly expanded, undecorated copper alloy buffer terminals. Similar to the example from the Polden Hills, although the latter is not hinged.
2. Beaded buffer terminals from a gilded copper alloy torc, with hollow circular-section neck-ring. These (as noted by Smith 1905, 138) are most similar to examples from the continent, although see similar finds from Britain at: Colchester (i), Fremington Hagg, and Maiden Castle.

19. Burnley, Lancashire

Location: Manchester Museum (O.9194)

A complete gold/silver alloy multi-strand torc with double-loop terminals. Said to have been discovered at Cliviger, near Burnley in 1802, it was in the possession of the Whitaker family from 1824, and was acquired by the Manchester Museum at a sale at Sotheby's on 11 April 1960 (Anon. 1980, no. M24; Hautenauve 2005, 233, no. 132; Lamb 2020). The neck-ring is formed from two faceted wires plied together (Stage II construction: (2P)F). Each double-loop terminal is continuous with the neck-ring wires, implying that on at least one side the ends of the wire have been closed by hammering or soldering. Metallurgical analysis carried out at Manchester Museum (Lamb 2020) revealed a surface composition of around 68% gold, 30% silver, and 0.5% copper.

20. Caistor, Lincolnshire

Location: The Collection Museum Lincoln

Gold alloy torc fragment with one surviving trumpet-headed buffer terminal, with a bead behind the flared trumpet, giving a thistle-shaped head. It was discovered by a metal detector user in 2013 (2013 T130; NLM-605352; Joy 2015, 151, fig. 9.6). The neck-ring is a solid bar with circular cross-section. The broken end of the neck-ring is an old break, but not particularly abraded. The neck-ring has been bent out of

shape, with two distinct 'kinks'. The torc belongs to Eluère's (1987) 'Torcs with Buffer Terminals and Intermediate Collars' group and to Hautenauve's (2005) Type IIIa ('Torcs with a Large Body and Terminals without a Clasp'). These torcs have a distribution centred on north-eastern France and western Germany, with one from as far away as Bulgaria (see Jacobsthal 1969 [1944], nos 43–8). Well-known examples of this type include the torcs from the Waldalgesheim grave (Joachim 1995, 61–3). Torcs of this type are dated by Eluère (1987, 28) to the end of the 5th century to the late 4th century BC and by Hautenauve (2005, 67–70) to the second half of the 4th and the beginning of the 3rd centuries BC.

Surface XRF analysis carried out as part of the Treasure process showed a composition of: 71–73% gold; 24–26% silver; 3% copper.

21. Bawsey, Norfolk

Location: British Museum and Norwich Castle Museum

Discoveries of complete or fragmentary torcs have been made over many years no more than 80m apart in a field located to the west of the church at Bawsey, near King's Lynn (NHER 5326). At least four torcs are represented. They may all come from a scattered hoard, although they could also originate from separate deposits. The first discovery of a complete gold/silver alloy loop terminal multi-strand torc (1) was made by a farmworker in 1941 (Wake 1942; Maryon 1944). In 1944 a loop terminal from another multi-strand gold/silver-alloy torc (2) was discovered, close to the site of the first find (Clarke 1950, 157). A few sherds of Iron Age pottery were also recovered (NHER 5326). Both torcs are now held at Norwich Castle Museum. In 1984, two decorated gold alloy buffer terminals (3) were discovered by a metal detectorist, Geoffrey Peach. Initially unreported, the findspot of Bawsey was eventually established (Stead 1998, 135–7, pl. 19).

There are many additional gold/silver alloy wire fragments (4) that probably derive from torc (3). In 1987 and 1988 metal-detector user S. Brown discovered further twisted wire strands (Stead 1998, 135–7): a gold/silver alloy wire was found in 1987 and two silver-plated wires in 1988. The metal was examined by Peter Northover but his report is unpublished (Stead 1998, 137) (NHER 5326). Further metal-detector finds of multiple twisted wire fragments were made by Brown in 1989, 1990, 1996 and 2006 (Hill in Barton and Hitchcock 2008, 54). The strands were broken rather than cut. Based on the colour of the metal and similarities between strands they probably all derive from the same torc broken up by agricultural machinery.

Two additional gold/silver alloy buffer terminals from a multi-strand torc (5) were recovered in 2005–7.

1. A complete gold/silver alloy multi-strand torc with thickened ring terminals and Stage II neck-ring formed from two thick wires plied together: (2P)R. Discovered in 1941 (Hautenauve 2005, 232, no. 128; Wake 1942, 26, fig. 4). Surface XRF metal analysis for the Treasure Trove inquiry revealed the following results:
   - Terminal A: 44.4% gold, 49.6% silver
   - Terminal B: 44.4% gold, 50.3% silver
   - Middle: 42.3% gold, 50.8% silver

   Norwich Castle Museum (1942.126)
2. Fragment of gold/silver alloy multi-strand torc comprising one thickened ring terminal and a section of neck-ring. formed from two thick wires plied together (Stage II construction: (2P)R). Found in 1944 (Clarke 1950, 157; 1954, 50–1, pl. xi, lower left; Hautenauve 2005, 232, no. 129).
   Norwich Castle Museum (1944.106)
3. Two decorated gold/silver alloy buffer terminals from a multi-strand torc. Found by metal detectorist Geoffrey Peach in 1984 who originally claimed they were from 'Fincham' (Hautenauve 2005, 232–3, no. 131). The flat faces of the cast terminals are decorated with curvilinear decoration in relief, including lobes, pellets, fin motifs, possible stylised bird heads, and trumpet voids. Only small lengths of the wire neck-ring remain, showing a Stage III construction of an unknown number of ropes coiled around a hollow core, with each rope formed from two circular-section wires plied together: (?C(2P))R.
   British Museum (1985,1204.1–2)
4. A large number of wire fragments from the same site are believed to have originally been part of Bawsey torc 3 (above); each consists of a short length of the Stage II 'rope', broken at both ends, formed from two circular-section wires plied together (Hautenauve 2005, 232, no. 130). Two such fragments were found by a second metal detectorist, S. Brown, in 1987 (Stead 1998, 135–7, pl. 19; Jope 2000, 255, pl. 121, l; unpublished metal analyses of the strands by Peter Northover). Further discoveries were made by Brown in June–November 1989, November 1990, November 1996 and March 2006. All are thought to derive from torc 3 (Hill in Barton and Hitchcock 2008, 54). The four fragments discovered in 2006 were analysed at the British Museum research lab. The report prepared for the Treasure report stated: 'Non-destructive X-ray fluorescence analysis has shown that the surface of each contained 26–38% gold and 54–66% copper, the remainder being copper. In all cases, there was a lower percentage of precious metal at the core than at the surface of the wires. Three of the four have wires of almost identical diameter (1.8mm), the fourth is slightly thinner. There is no analytical reason to suspect that the four fragments did not come from the same object.'
   British Museum (1989,1201.1–2, 1990,0304.1–135, 1991,0602.1–7, 1997,0901.1–3)
5. Another pair of decorated gold/silver alloy buffer terminals from a multi-strand torc were discovered by metal-detecting in 2005–7 (2006 T13; 2005/6 TAR no. 81; 2007 T104; 2007 TAR no. 68; NMS-D3BF38). Each has short stubs of neck-ring wires protruding on the reverse, though the precise construction of the neck-ring cannot be determined. The flat front faces of the terminals are decorated with engraved curvilinear designs based around a triskele, areas of which are infilled with finely punched dots. On one terminal these dots are arranged in lines to create the impression of 'basket-weave' hatching, whilst on the other the arrangement is apparently random. The edges of the terminals are decorated with a cable design. Surface analysis carried out as part of the Treasure process revealed similar metal

contents for both terminals: 33–36% gold, 58–61% silver, with the remainder being copper.
Norwich Castle Museum 2007.229 and 2008.226

22. Blackborough End Quarry pits, Middleton, Norfolk
Location: British Museum (1985,0303.1)
A complete gold/silver-alloy multi-strand torc with triple-loop/ring terminals was found in June 1984 at a carrstone quarry called Mill Drove Quarry at Blackborough End, East Winch, Norfolk (Hautenauve 2005, 237, no. 149). An account of its discovery is provided by Natasha Hutcheson: 'This torc … was recovered after it had been through the Quarry's stone crusher (SMR 12559); miraculously it survived' (Hutcheson 2004, 43). The torc was declared Treasure Trove at an inquest on 25 October 1984 and acquired by the British Museum. The neck-ring is a Stage III construction of two ropes plied together Z-twist, each of which is formed from two circular-section wires plied together S-twist: (2PZ(2P))R. The combination of different twist directions gives the effect of a braid, but the neck-ring is formed purely by twisting. Each triple terminal consists of, at the front, a double loop continuing into one of the neck-ring ropes and, at the back, a thickened ring formed from the ends of the wires of the other neck-ring rope, with additional metal added to create a closed ring from the open ends of the wire.

23. Near Diss, Norfolk
Location: Unknown
Gold/silver alloy multi-strand torc with double-loop terminals. The torc was rediscovered in 2004–5, during the disposal of the estate of Mr Walter Banks by his widow Mrs Doris Banks. It was given by Mrs Banks to Diana Birch who sent it to Mr John Haywood of Spink for valuation. Mr Haywood recognised the artefact as possibly ancient and contacted the British Museum in March 2010, who confirmed it could be Iron Age. The torc is thought to have been found 'near Diss' sometime in 1942/3 and had remained in a safe deposit box until Mr Banks' death. As it was found before 1996 it came under the Treasure Trove legislation. It was subsequently declared not Treasure Trove (2010 T194) on the grounds it was probably not buried with the intention of retrieval. The Stage II neck-ring comprises two circular-section wires plied together. Rather than being made from a continuous length of wire doubled back on itself at one of the terminals, the torc is formed from two wires. Each terminates in an open loop at each end, giving the two double-loop terminals. Non-destructive XRF analysis conducted in the Department of Conservation and Science, the British Museum, revealed the metal was 81–85% gold, 14–16% silver, the remainder being copper.

24. Forncett, Norfolk
Location: Norwich Castle Museum
Metal-detected find made in 2015 and subsequently acquired by Norwich Castle Museum (NMS-7ACEC5; 2015 T863). Short length of gold/silver alloy multi-strand torc neck-ring or bracelet body formed from two circular-section strands of wire plied together. Stage II construction: (2P)R. Cut at both ends. The slight S-shaped curvature of the piece may suggest that it was originally part of a larger Stage III construction, but this is now impossible to determine with certainty.

25. Gayton, Norfolk
Location: Unknown
A metal-detected find made in 2005, comprising a short length of gold/silver alloy multi-strand torc neck-ring or bracelet body (2005 T544; 2005/6 TAR no. 83; NMS-35C242). What remains is a Stage II construction formed of four circular-section wires plied together. The slightly coiled shape of the piece strongly suggests that it was originally part of a larger Stage III plied or coiled construction: (?C/P(2P))R. The fragment has been deliberately cut at one end, although the other end appears to be a break. Surface XRF carried out as part of the Treasure process shows the wires are over 80% gold.

26. North Creake, Norfolk
Location: Norwich Castle Museum (1949.97)
Gold/silver alloy hollow cast torus terminal from a multi-strand torc. Discovered during ploughing in 1947, about half a mile north-west of Shammer House, North Creake, on high ground five miles from the north Norfolk coast (Clarke 1951a, 59; Hautenauve 2005, 238, no. 152). The terminal is decorated with raised lobes, pellets and inscribed fin motifs. Broken-off wires cast onto the interior still survive at the mouth of the terminal. The original neck-ring was probably a Stage III construction with six ropes coiled around a hollow core, each made from a number of circular-section wires: (6C(?P))R.

27. Norwich, Norfolk
Location: Norwich Castle Museum
Gold/silver alloy rotating dorsal muff from a small tubular torc, a metal-detected find made in 2007 and since acquired by Norwich Castle Museum (2007 T119; 2007 TAR no. 69; NMS-C6DFC1). A composite ring formed from an inner sheet tube, around the outside of which are two broad semi-circular-section concentric hollow ribs (or tubes), decorated in between and on each outer face with rings of narrow, twisted square-section wire. Surface XRF carried out as part of the Treasure process shows a composition of 84–87% gold and 10–12% silver, the remainder being copper.

28. Sedgeford, Norfolk
Location: British Museum (1968,1004.1 and 2005,1103.1)
A gold/silver alloy multi-strand torc in two parts, one, discovered in 1965, comprised a hollow torus terminal and most of the neck-ring (Brailsford 1971; Jope 2000, 84, 254, pls 114–15; Hautenauve 2005, 238, no. 153); the missing terminal was found in 2004. The Stage III neck-ring is formed of eight ropes coiled together around a hollow core, each rope made up of three circular-section wires plied together: (8C(3P))R. The terminals are decorated with relief curvilinear decoration including lobes, trumpet voids, and raised pellets with triple dots set in circular fields of 'basket-hatching'. The collars are also decorated with raised pellets set in a 'basket-hatched' background. The larger torc fragment was discovered on 6 May 1965 during mechanised

harrowing of a field called Polar Brek at West Hall Farm, Sedgeford, in Norfolk (Brailsford 1971, 16). In 1993 a British Museum project which aimed to locate the second part of the torc was abandoned when the landowner withdrew permission because he wanted to benefit financially from any potential new discoveries. The missing terminal was subsequently located at the site in April 2004 by Dr Hammond whilst metal-detecting as part of a survey conducted by SHARP (Sedgeford Historical and Archaeological Research Project) in a long-running study of the history and archaeology of the parish of Sedgeford (Dennis and Faulkner 2004). As Hill suggested in his Treasure report on the find, 'this discovery is almost certainly the missing terminal, as it is identical in size and design to the earlier discovery' (Hill in Hitchcock 2006, 48–9). There is no sign that the terminal was deliberately separated from the rest of the torc in the past. It is more likely damage was caused by modern agricultural activity.

29. South-west Norfolk

Location: Norwich Castle Museum (2005.218)

Gold/silver alloy multi-strand torc with torus terminals (Hill in Gannon *et al.* 2004; Davies 2008, fig. 67), discovered by two metal-detector users, Mr Leach and Mr Carter, sometime before May 2003. It was declared Treasure in November 2003 and acquired by Norwich Castle Museum.

The terminals are crude torus, open in the interior of the eye, similar in form to Snettisham torc L.1. Each terminal has a groove running down the centre of the torus, as if dividing it into two adjacent rings; this dividing line is decorated with raised scallop or zig-zag mouldings. The collar is decorated with raised pellets with triple dots, set in a 'basket-hatched' field. The Stage III neck-ring comprises four ropes plied together, each rope formed of six circular-section wires coiled together around a hollow core: (4P(6C))R. The torc was damaged by recent agricultural activity. One rope is 'buckled' close to one of the terminals and the ropes are less tightly coiled on one half of the neck-ring.

30. Weybourne, near Sheringham, Norfolk

Location: Unknown

A hoard of gold coins was eroded out of the cliffs at Weybourne and discoveries of coins were made there from *c.* 1914 to the late 1960s (Allen 1971, 140–1; Haselgrove 1987, 327–8). Haselgrove (1987, 328) noted at least 63 coins as well as a possible fragment of a gold alloy tubular torc and speculated the finds originated from two hoards, perhaps held in a pottery container due to the presence of small quantities of Iron Age pottery at the site.

31. Ulceby, North Lincolnshire

Location: Ashmolean Museum (torcs) and Liverpool Museum (bridle bit); other finds lost

Three multi-strand torcs and a simple bar bracelet were discovered sometime around 1847 during excavations for a railway cutting (Cuming 1859; Leeds 1933; May 1976, 156–62). They were found alongside three horse bit fragments, all constructed of copper alloy around an iron core. It is thought that the bridle bits were damaged in antiquity (May 1976, 159). Two of the bits are now lost, while one ring with the decorated end of a link is now in Liverpool Museum (Leeds 1933, 466).

1. Gold/silver alloy multi-strand torc with double-loop/ring terminals (Hautenauve 2005, 256, no. 225). The neck-ring is formed of four circular-section wires plied together: (4P)R. The front part of each terminal is a thickened ring, continuous with two of the neck-ring wires; the back part is a simple continuous loop formed from the other two neck-ring wires. Ashmolean Museum (1927.6659)
2. Gold/silver alloy multi-strand torc with quadruple-loop terminals (Hautenauve 2005, 256, no. 226). The Stage III neck-ring is formed of three ropes plied together S-twist, each made up of two circular-section wires plied together Z-twist: (3P(2PZ))R. The mixture of twist directions creates the effect of a braid. At each terminal, the two wires of each neck-ring rope form a continuous loop: two single and one double, creating quadruple-loop terminals. Ashmolean Museum (1927.6660)
3. Fragment of gold/silver alloy multi-strand torc, comprising a single-loop terminal and a section of neck-ring (Hautenauve 2005, 256, no. 227). The neck-ring was originally formed of two thick wires plied together. The torc is said to have been complete when it was found but was broken up by a lady '... who snapped it in pieces for distribution among her friends' (Cuming 1859, 226). Lost.
4. Gold/silver alloy bracelet. It was complete when found but like torc 3 it was broken up following its discovery (Cuming 1859, 227). Judging by the illustration in Cuming (1859), it was formed from a bar with rectangular cross-section, like some of the examples from Snettisham (May 1976, 159). Lost.

32. Fremington Hagg, North Yorkshire

Location: Yorkshire Museums Trust (H 141 105)

Fragment of copper alloy beaded-terminal rod torc or bracelet, found before 1833, possibly in association with a large hoard of Early Roman copper alloy fittings (MacGregor 1976, no. 196). The fragment comprises one of the terminals, a slightly dished buffer terminal with three bead mouldings behind it along the short surviving length of circular-section neck-ring or body. See similar finds from Colchester (i), Maiden Castle and Upchurch.

33. Towton, North Yorkshire

Location: York Museums Trust

Two Iron Age gold/silver alloy multi-strand bracelets were reportedly discovered in a streambed in the Towton area, though there are uncertainties about the accuracy of this findspot information.

1. Gold/silver alloy multi-strand bracelet with loop terminals (2010 T350: SWYOR-CFE7F7). The body of the bracelet is made up of two circular-section wires plied together: (2P)R. Each terminal is a continuous loop formed from the neck-ring wires. Surface XRF carried out as part of the Treasure process shows a composition of 80–84% gold; 12–14% silver; and at least 4% copper.
2. Gold/silver alloy multi-strand bracelet with ring terminals (2011 T326: SWYOR-681CE4). The Stage III body is formed from two ropes plied together Z-twist, each of which is formed from two circular-section wires

plied together S-twist: (2PZ(2P))R. The mixture of twist directions creates a braided effect. Each terminal was originally formed from two loops, each loop continuous with the two wires of one of the neck-ring ropes. The outside surface of the terminals has been filled with a lower melting point gold/silver/copper alloy, containing approximately 16% more copper than the rest of the bracelet. The overall effect is to transform double-loop terminals into single-ring terminals. Surface XRF carried out as part of the Treasure process shows a composition of 55% gold, 38% silver, and at least 7% copper.

34. Great Houghton (Brackmills), Northants

Location: Northampton Museums

A female skeleton wearing a neck-ring was discovered during archaeological excavation at Great Houghton, Northamptonshire (Chapman, A. 1998; 2000–1). The skeleton lay face down in a large circular pit. It was crouched laying on its right side and the excavator thought the hands may have been bound (Chapman, A. 2000, 9). The woman was 30–40 years old when she died and 1.56m tall. Radiocarbon dates were obtained which dated the skeleton as Iron Age, specifically to 2320 ± 60 BP (405–370 cal BC at 68 % probability, 505–205 cal BC at 95.4% probability) (*ibid.*, table 6).

The torc comprises two curved rods, each terminating at one end in a slightly flared, flat buffer terminal. These terminals are circular in cross-section, while the rest of the neck-ring is broadly square in section and slightly twisted. The opposite ends of each rod seem to articulate: one is notched and the other perforated, suggesting the halves were originally bound together with an organic material which no longer survives. The torc was found around the neck of the deceased, with the circular terminals overlapping at the nape, suggesting the torc was being worn 'backwards' compared to the position that might be expected (see discussion above on how torcs were worn).

Metal analysis revealed the torc is made from an alloy of lead with a high tin content, also containing traces of zinc, copper and iron (*ibid.*, 24).

35. Newark, Nottinghamshire

Location: Acquired by Newark and Sherwood Museums Service, Millgate Museum, Newark

A gold/silver alloy multi-strand torc with hollow torus terminals, found by Mr M. Richardson while metal-detecting in February 2005 (Hill in Barton and Hitchcock 2008, 55, see also Machling and Williamson 2018). The terminals are decorated with a raised curvilinear design of ovals, trumpets and peltas, and have narrow collars decorated with raised pellets with triple dots. The Stage III neck-ring comprises eight ropes coiled around a hollow core; each rope is formed of four circular-section wires plied together: (8C(4P))R. There is evidence of wear: black silver oxide deposits can be seen on the raised parts of the decoration of both terminals and in an ancient cut on one of the terminals. Some ropes on the back of the neck-ring are also raised, indicating stresses where the torc has been put on and taken off. Both terminals are also polished or worn on one side (presumably the underside when worn), showing the torc was consistently worn the same way up. Surface analysis of the terminal and neck-ring indicated a metal content of around 67% gold and 32% silver.

36. Ellesmere, Shropshire

Location: British Museum (2015,8032.1)

A metal-detected find from 2012 comprising a short length of gold/silver alloy multi-strand torc neck-ring or bracelet body, cut or broken at both ends (HESH-D6AEA; 2013 T38). What remains is a Stage II component of two circular-section wires plied together: (2P)R. As part of the Treasure process, non-destructive XRF analysis of the surface on each of the wire strands was carried out by Teresa Gilmore and staff of the Conservation Department of Birmingham Museum and Art Gallery/Birmingham Museums Trust. The results were:

- Strand 1: 58.74% +/- 0.38 gold; 36.27% +/- 0.31 silver; 4.55% +/- 0.10 copper
- Strand 2: 59.58% +/- 0.37 gold; 31.66% +/- 0.28 silver; 8.76% +/- 0.13 copper

37. Telford, Shropshire

Location: Acquired by Shropshire County Museum Service

Part of a gold/silver alloy multi-strand torc (in two pieces), comprising a single-loop terminal, a continuous loop formed from the end of the two remaining neck-ring wires, and a second fragment of the neck-ring wire, cut at one end (2008 T557; 2008 TAR no. 72; WMID-C53CB8). What remains of the neck-ring rope is a Stage II component of two circular-section wires twisted together. It is coiled in such a way as to suggest that it originally formed part of a Stage III construction, e.g. (?P(2P))R, probably with at least one other similar rope, perhaps forming a double-loop terminal torc.

Surface XRF carried out as part of the Treasure process shows a composition of gold 55–60%, silver 39–43%, the remainder being copper.

38. Cadbury Castle, Somerset

Location: Museum of Somerset, Taunton

Five components of jointed iron neck-rings, representing at least three objects, were found in the mid-1st-century AD deposits in the south-west gateway complex at Cadbury Castle (MacDonald in Barrett *et al.* 2000, 123–5, 130–1, fig. 59, nos 19–20, fig. 63, nos 64, 72, 73). These are simple ornaments formed from circular-section iron rods. Each neck-ring comprised two separate components, one rod forming around two thirds of the circumference, and another to complete the final third, the two coming together with mortice and tenon joints.

39. Camerton, Somerset

Location: British Museum (1982,0103.274)

Iron multi-strand torc with single-loop terminals and neck-ring formed from two wires or rods plied together Z-twist: (2PZ)R (Jackson 1990, 63–4, pl. 28, no. 274). Found with a large assemblage of bronze and iron finds unearthed by deep ploughing in 1980 in fields north of a Romano-British settlement at Camerton, likely dating to the 1st century AD. The two terminals are joined by a linking bar of similar

construction to the torc itself: an iron rod doubled back on itself to give a loop at one end (passing through one of the torc terminals) and a hook at the other (to hook into the other terminal); in the central section of the linking bar the doubled rod is plied Z-twist, as for the torc. See similar finds from Spetisbury, Ham Hill and Danebury.

40. Clevedon, Somerset

Location: British Museum (AF.412: Part of the Franks bequest acquired in 1897)
Gold/silver alloy buffer terminal and neck-ring fragment (Smith 1905, 138, fig. 126; Hautenauve 2005, 234, no. 136). According to S.J. Percival, the torc was 'found near Walton Castle, Clevedon, Somerset: about 20oz [567g] was found but it was mostly melted by Parson & Son, Bristol' (Franks catalogue held by the Department of Britain, Europe and Prehistory, British Museum).

The buffer terminal is hollow and is ornamented in relief on the flat face and around the edges (**Fig. 21.11c**). The decoration on the face is arranged in a triangular pattern with raised detail and three motifs filled with basket-hatching. The side is decorated with a series of adjoined cusp motifs also filled with basket-hatching and linked by a raised sinuous line. The neck-ring fragment is a Stage III construction: (3PZ(2P))R. Three ropes are plied together Z-twist; each rope is formed of two circular-section wires plied together S-twist.

Both Clarke (1954, 64, note 6) and Jope (2000, 85, 254, pl. 120) argued the neck-ring does not belong to the terminal. Jope even suggested the terminal belongs to a tubular torc. Based on the description of the discovery from the Franks catalogue this seems unlikely. Although the surviving strand is not thick enough to form the neck-ring, the original neck-ring could have been formed of multiple ropes (perhaps three or four) of this type, the substantial remains of which were lamentably melted down by Parson & Son. Machling and Williamson (2019) have suggested that parts of the terminal might be from a reworked torus terminal similar to that seen on the Snettisham 'Great Torc'.

41. Ham Hill, Somerset

Location: Museum of Somerset, Taunton
At least three multi-strand iron torcs with loop terminals and a plain iron neck-ring have been recovered from Ham Hill Hillfort, the latter in a burial. See similar multi-strand iron torcs from Camerton, Danebury and Spetisbury.

1. Plain iron ring found in an inhumation burial excavated within the hillfort, worn around the neck. Other grave goods with the individual included an iron chisel and adze (Anon. 1886, 82, pl. III.2; Whimster 1981, 239; Smith 1905, 138; Fitzpatrick 1999, 114).
2. Iron multi-strand torc with single-loop terminals and neck-ring formed from two wires or rods plied together Z-twist: (2PZ)R. Found during quarrying on the site in 1930 (Thomas 1965, pl. 270; Fitzpatrick 1999, 114).
3. Iron multi-strand torc with single-loop terminals and neck-ring formed from two wires or rods plied together, with a linking bar through the terminals. Found at the foot of a quarry face, probably eroded out of pits on the site (Fitzpatrick 1999, 113–15).
4. As no. 3 and found interlinked with no. 3 at the terminals (Fitzpatrick 1999, 113–15).

42. Polden Hills, Somerset

Location: British Museum (1846,0322.117 and 118)
A simple buffer terminal torc formed of an iron core with six copper alloy wires coiled around it (Brailsford 1975b, 230, pl. XXi, e). The torc was found in a hoard mostly comprising horse harness gear and trappings, first reported in 1803, from the Polden Hills, Somerset. The material from the hoard dates from *c.* AD 43–70 (Davis and Gwilt 2008, 164).

43. Alrewas, Staffordshire

Location: Potteries Museum and Art Gallery, Stoke-on-Trent
The hoard was discovered in July 1994 by a metal detectorist, Mrs Emma Gray, at Overley Farm, Alrewas, Staffordshire (Hautenauve 2005, 255–6, no. 224, fig. 349). It contained a group of three gold/silver alloy multi-strand torcs or torc fragments (1–3), a circular-section penannular gold/silver alloy ring (4) and a length of narrow, circular-section gold alloy wire (5). The torcs were bent out of shape in antiquity, bundled together and passed through the ring. The wire fragment (5), which is coiled into a spiral, was also looped through the ring (4). A separate fragment (6, one of the buffer terminals of torc 1) probably became detached from the bundle of artefacts during recent agricultural activity. The hoard was declared Treasure Trove (TT 336) on 3 May 1996 and was later acquired by the Potteries Museum and Art Gallery, Stoke-on-Trent. Further investigation of the site was attempted by Dr Ian Stead of the British Museum, but plans were abandoned when the landowner insisted on financial reward for any potential further finds.

1. Fragment of gold/silver alloy multi-strand torc neck-ring, broken at both ends. Formed from six wires (three circular-section, three twisted), coiled around a hollow core. Stage II construction: (6C)[3R+3T].
2. Gold/silver alloy multi-strand torc with loop terminals and neck-ring formed from three circular-section wires plied together. Stage II construction: (3P)R. The whole torc is formed from a single wire: each terminal comprises one continuous loop where the wire is doubled back on itself, and one open loop. At one terminal this open loop is incomplete, and the wire hammered partly flat around the continuous loop; this terminal may be unfinished. The whole torc is distorted, pulled open, bent near the centre, and slightly untwisted.
3. Gold/silver alloy multi-strand torc with loop terminals and neck-ring formed from three twisted wires plied together. Stage II construction: (3P)T. The whole torc is formed from a single wire: each terminal comprises one continuous loop of twisted wire where it is doubled back on itself, and one open loop formed from the circular-section end of the wire. The whole torc is distorted into a T-shape, with the folded body of the torc forming the double-thickness stem of the 'T' and the terminal ends crossed and bent to form the two halves of the cross-bar. The ring (4) passes through the centre of the cross-bar of the T.
4. A gold/silver alloy penannular ring of thick circular-section wire.

5. A length of gold/silver alloy wire bent to form a spiral ring. A droplet of melted gold is also visible on the wire.
6. Fragment of gold/silver alloy multi-strand torc comprising a short length of neck-ring and one simple buffer terminal. The neck-ring construction is as for fragment 1, (6C)[3R+3T], and this most likely represents one of the missing pieces of this torc. The simple cap terminal was not cast on; instead it is formed from sheet metal hammered onto the neck-ring wires.

The artefacts were analysed using non-destructive surface XRF for the Treasure Trove report. The semi-quantitative results were as follows:

- Torc 1: 78% gold, 20% silver, 1.3% copper
- Torc 2: 71% gold, 26% silver, 2.4% copper
- Torc 3: 67% gold, 29% silver, 4.1% copper
- Ring 4: 72% gold, 27% silver, 1.5% copper
- Ring 5: 71% gold, 26% silver, 2.4% copper
- Torc 6: 78% gold, 20% silver, 1.6% copper

44. Glascote, Tamworth, Staffordshire

Location: Birmingham Museum

A complete gold/silver alloy multi-strand torc with triple-ring terminals (Painter 1970; 1971; details of metal analysis by M.J. Hughes in Painter 1971; Jope 2000, 84, 254, pl. 119; Hautenauve 2005, 234, no. 138). The torc was found around 1943 by two workers while digging a trench at a boat building yard situated by the Coventry Canal, between Glascote and Amington, near Tamworth, Staffordshire. It was identified and declared Treasure Trove in 1970.

The Stage III neck-ring comprises six ropes coiled together Z-twist around a hollow core, each rope made up of two circular-section wires plied together S-twist: (6CZ(2P))R. The mixed twist directions created a braided effect. One wire is broken near the back of the torc. The ring terminal is a merged triple loop, with significant additional metal added onto the neck-ring wires, decorated with two punched lines of zig-zag decoration between the three loops. The ring terminals are continuous with the neck-ring wires, each of the three ring elements extending into two of the ropes.

Whilst unusual, the torc exhibits strong similarities to finds from Snettisham. The neck-ring construction and general form of the triple terminal is very similar to torc L.16, and the zig-zag decoration between the loops of the merged ring terminal is similar to that seen on L.18.

Metal analysis for the Treasure Trove report revealed the metal content at the surface:

- Wire: 29.8% gold; 41.9% silver; 27.2% copper
- Terminal: 53.9% gold; 36.6% silver; 9.9% copper

45. Leekfrith, Staffordshire

Location: Potteries Museum and Art Gallery, Stoke-on-Trent

Metal-detected find made in 2016, acquired by the Potteries Museum. The hoard comprises four objects. Although disturbed by ploughing, it appears that they were placed into the ground as a single nested deposit, near the top of a low hill. The two thistle terminal torcs and the bracelet have their closest parallels on the continent, dating from the 4th to 3rd centuries BC (see also the find from Caistor, above). Imports from this period are rare in Britain (Joy 2015). The torcs were tested using non-destructive XRF at Birmingham Museums Conservation Laboratory by Pieta Greaves (Drakon Heritage and Conservation), assisted by Teresa Gilmore (Birmingham Museums). The results showed a relatively consistent surface composition across all four objects of 74–78% gold, 18–22% silver, 2–3% copper, with small amounts of iron (0.3–1.5%), which may be from the soil. The lower gold purity of the torcs compared to continental pieces leaves open the possibility that these objects could have been made in Britain, even if undoubtedly based on continental types (Farley *et al.* 2018).

1. Gold alloy torc with a plain, circular-section neck-ring which expands towards thistle-shaped buffer terminals. Each terminal consists of a circular 'bead', narrowing towards a slimmer waist and then flaring out to a trumpet-shaped head with slightly concave circular face. Each terminal is decorated with concentric lines around either side of the 'bead' and the wide external edge of the 'trumpet'. It also has stamped decoration in the form of small triple-circle motifs where each end of the neck-ring meets its terminal. The torc has been bent out of shape but is otherwise in very good condition.
2. Gold alloy torc with a plain, circular-section neck-ring which expands towards thistle-shaped buffer terminals. Similar to no. 1, but slimmer and less ornate in form. The circular inner face of each 'trumpet' head has an irregular polygonal indentation, but the surface is otherwise undecorated. The torc is broken into two pieces, probably plough damage along an existing stress line in the metal, and its shape is distorted.
3. Gold alloy torc formed from a pair of circular-section gold wires plied around one another. At either end, the two wires are hammered and soldered together to form a single rod, which is bent back on itself in a hair-pin bend. The two ends are hooked together to form a simple clasp. Each clasp terminates in a small trumpet-shaped knob with concave circular face. The torc has been bent into an irregular shape as if it has been 'folded'; this was probably caused by plough damage.
4. Gold alloy bracelet with flared trumpet-shaped terminals, a variant of the thistle type, with smaller and simpler circular buffer ends, though with the same concave circular face. The outside of each terminal is decorated with three pelta-shaped loops of gold wire creating a fan-like motif. The surface of the bracelet is decorated with chased or engraved lines which fan out from the centre of the motif towards the sides. The overall effect creates an unusual design which may be connected to Early Style traditions of Celtic art, referencing Mediterranean motifs such as the Greek palmette. The body of the bracelet is made from four 'wires' twisted around one another Z-twist. Two are thick strips extending from the terminals, each flattened into a U-shape. The other pair, which spiral around the central join between the larger two, are thin lengths of square-section wire which have been tightly twisted on themselves to give a rope-like effect.

46. Needwood Forest, Staffordshire

Location: Property of the Crown (Duchy of Lancaster), on loan to the British Museum (DR.40)

A gold/silver alloy multi-strand torc found at the mouth of a fox hole in Needwood Forest in 1848 (Ellis 1849; Hawkes 1936; Jope 2000, 84, 254, pl. 118; metal analysis by M. J. Hughes in Painter 1971, 309; Hautenauve 2005, 237, no. 151). The ring terminals are cast onto the ends of the neck-ring wires, and give the impression of two merged loops. The outside edge of each terminal is decorated with nine raised pellets. Each is further ornamented with incised decoration positioned between the two loops, including zig-zag lines. The Stage IV neck-ring comprises four cables loosely plied together Z-twist. Each cable is formed from two ropes plied together S-twist and each rope is formed from four circular-section wires coiled together S-twist: (4PZ(2P(4P)))R. The mixture of twist directions creates a complex visual effect.

Surface metal analysis for the Treasure Trove inquiry showed:

- Wire: 65.9% gold; 29.4% silver; 5.63% copper
- Terminal: 50.0% gold; 30.6% silver; 17.2% copper

47. Shenstone, Staffordshire

Location: Unknown

Metal-detecting in 2019 uncovered a fragment comprising around half of a copper alloy torc with thistle-headed buffer terminals and solid circular-section neck-ring (WMID-62A518). The break appears to be in an area of natural weakness in the metal and may be due to plough damage rather than deliberate fragmentation. The torc most likely dates to the 4th to 2nd centuries BC and is most widely paralleled on the continent. Similar finds have been made in Britain in the River Medway near Aylesford and the River Walbrook, in London.

48. Great Finborough, near Stowmarket, Suffolk

Location: Unknown

A fragment of folded gold sheet with decoration similar to that seen on the terminals of the Snettisham 'Great Torc' was discovered by a metal detectorist in 1996 (Anon. 1997, 86, fig. 17.G). As the find was made before the Treasure Act (1996) came into place in July 1996, it was processed under Treasure Trove (TT 384) and returned to the finder. The fragment has been deliberately cut and folded, but was probably originally part of the torus terminal of a multi-strand torc.

49. Ipswich, Suffolk

Location: British Museum (1969,0103.1–5 and 1971,0203.1)

A hoard of six gold/silver alloy multi-strand torcs (Brailsford 1968; Brailsford and Stapley 1972; Owles 1969; 1970; Jope 2000, pls 116–17; Hautenauve 2005, 235–6, nos 142–7). The findspot is on higher land (30.5m OD), 3.2km east of Ipswich town centre, overlooking a tributary of the Belstead Brook (Owles 1969, 208). The first five torcs were discovered on 26 October 1968 by Mr Malcolm Tricker while operating a mechanical digger. The sixth torc was found on 18 October 1970 by Mr P.J. Gorham whilst digging in his garden at 50 Holcombe Crescent. The findspot of the sixth torc was around 65m from the original hoard. It is thought all six torcs originated from the same hoard but the sixth torc was separated during earth-moving at the site (Owles 1970, 294; Brailsford and Stapley 1972, 219) which involved cutting back a part of the hillside to enlarge the gardens on Holcombe Crescent (Owles 1969, 208).

The first two torcs uncovered in 1968 were hooked together. Mr Tricker uncovered three more also linked (Owles 1969, 208; Brailsford and Stapley 1972, 219). In a letter to John Brailsford dated 12 November 1968 and located in the correspondence archive held by the Department of Britain, Europe and Prehistory at the British Museum, the finder is quoted as saying: 'I should think they were in the soil at an angle of 45 degrees, about six feet [1.8m] down. Having pulled out the first, I discovered a second attached to it. Laying close by, at the same angle, I found another one, and this time two were entangled with it. One of these being the plain one, and the rest all patterned.' On later inspection of the findspot Owles concluded: '… there was no trace of a pit, either at the level at which the torcs were found or in the area above it. The top soil had already slipped down the slope and it seems likely that the torcs were lying fairly close to the surface and that they too had fallen from a higher level. There was no evidence of a burial' (Owles 1969, 208).

1. Gold/silver alloy multi-strand torc with thickened ring terminals and Stage II neck-ring of two faceted wires plied together Z-twist: (2PZ)F. (1969,0103.1)
2. to 5. Gold/silver alloy multi-strand torcs with ring terminals. The terminals are elaborately decorated with curvilinear designs in relief and were formed using the lost-wax technique (Stapley in Brailsford and Stapley 1972). The neck-rings each comprise two thick faceted wires plied together. On three of the torcs this is S-twist, while on one (1969,0103.2) it is Z-twist. Brailsford (in Brailsford and Stapley 1972, 220–1) suggested the decoration on torcs 2–5 is unfinished due to its rough appearance. This argument was challenged by Spratling (in Wainwright and Spratling 1973, 123–4), following his work on the moulds from Gussage All Saints. (1969,0103.2–5)
6. Gold/silver alloy multi-strand torc with torus terminals cast or soldered onto the neck-ring. The Stage III neck-ring is formed of two ropes plied together S-twist, each of which is made up of two thick, faceted wires plied together Z-twist: (2P(2PZ))F. The mixture of twist directions creates the impression of a braid. The terminals resemble triple-ring terminals, with zig-zag decoration around the outside of the eye of the ring, and lines of simple beaded decoration running around the circumference of the joins between the rings. The narrow collar is decorated with a herringbone pattern, suggesting a braid. (1971,0203.1)

Metal analysis for the Treasure Trove inquest revealed the following surface compositions::

- Torc 1 terminal: 80.2% gold; 12.4% silver; 4.4% copper
  neck-ring: 81.3% gold; 16.7% silver; 2.0% copper
- Torc 2 terminal: 78.1% gold; 10.1% silver; 11.8% copper
  neck-ring: 65.9% gold; 27.8% silver; 6.3% copper
- Torc 3 terminal: 85.5% gold; 10.7% silver; 1.3% copper
  neck-ring: 80.6% gold; 18.8% silver; 0.4% copper
- Torc 4 terminal: 88.7% gold; 11.3% silver; 1.8% copper
  neck-ring: 85.2% gold; 11.0% silver; 0.7% copper

- Torc 5 terminal: 82.0% gold; 16.9% silver; 1.6% copper neck-ring: 77.3% gold; 16.9% silver; 1.4% copper
- Torc 6 neck-ring: 84.0% gold; 15.0% silver; 0.3% copper

50. Shepherd's Fen, Suffolk

Location: Museum of Archaeology and Anthropology, Cambridge (1929.186)

Penannular copper alloy bracelet found in Shepherd's Fen near Mildenhall around 1930 (Lethbridge and O'Reilly 1931, 152, pl. VI, fig. 1). A simple one-piece ornament with body formed from circular-section rod and expanded buffer terminals with stylised curvilinear zoomorphic decoration. Closest in form to the thistle terminal torcs seen in the UK at Aylesford, Shenstone and Walbrook.

51. Netherurd, Kirkurd, Tweeddale (also known as 'Cairnmuir' or 'New Cairnmuir')

Location: National Museum of Scotland (FE46–48) (some finds lost)

Found in March 1806 in a hollow on the side of Shaw Hill, near New Cairnmuir house, Kirkurd, Peeblesshire (Lawson 1858; Feachem 1958; MacGregor 1976, nos 191–4; Jope 2000, 81–4, 253, pl. 110.). Confusion over the name given to the hoard derives from changes to the name of the nearby house which gives the hoard its title.

Three bracelets and a torc fragment were found with 'upwards of 40 gold coins' of which only two survive (Feachem 1958, 112). The remaining coins are both Gallo-Belgic XB. The distribution of this type of coin is focused in an area north-east of Paris (Hunter 1997, 515). The only other known examples from Britain are all from Dorset and the type dates from the late 2nd century BC–mid-1st century BC (Fitzpatrick 1992b, 10; Haselgrove 2009).

Of the torcs, only the terminal (4) remains; the others were sold/and or destroyed. Fortunately, illustrations of the torcs were published (Lawson 1858 1833; Feachem 1958).

1. and 2. Two gold/silver alloy multi-strand bracelets with double-loop terminals and Stage II bodies formed from two circular-section wires plied together Z-twist: (2PZ)R (Hautenauve 2005, 233, no. 134).
3. Gold/silver alloy bracelet formed from a single, twisted square-section wire. The terminals are solid, flattened and point outwards (Hautenauve 2005, 233, no. 135).
4. Gold/silver alloy hollow torus terminal, probably originally from a multi-strand torc (identified by Clarke 1951a, 60; Hautenauve 2005, 233, no. 133). The terminal is decorated with raised lobes, petals and cusps, defined by hatching. See also Machling and Williamson (2018).

52. Middleton Hall, Middleton, Warwickshire (near Tamworth, Staffordshire)

Location: British Museum (1977,0401.1)

Gold/silver alloy multi-strand torc fragment comprising a neck-ring of six braided ropes (Hautenauve 2005, 237, no. 150). Each rope is formed of two circular-section wires twisted together. Both terminals are missing. The torc was found by Mrs G.M. Sadler while working land at Middleton Hall, Warwickshire in October 1968. It was identified in 1976, declared Treasure Trove in 1977 and acquired by the British Museum. Metal analysis conducted for the Treasure Trove inquiry showed the surface metal content was 74% silver, 25% gold and 1% copper.

53. Westhampnett, West Sussex

Location: Chichester and District Museum

A small fragment of gold alloy sheet found in burial 20095 at the Late Iron Age cremation cemetery at Westhampnett is believed to be from a tubular torc (Fitzpatrick 1997, 97–9, 149). The burial contained the cremated remains of an infant or young juvenile and an older sub-adult. The remains have been radiocarbon dated to 200–80 cal BC (95% probability; Haselgrove *et al.* 2018, table 1). Metallurgical analysis of the surface of the fragment showed a composition of around 89% gold, 10% silver and 1% copper.

54. Pershore, Worcestershire

Location: British Museum (2014,8003.1–2)

Two gold/silver alloy fragments associated with a coin hoard found in 1993 near Pershore in Worcestershire are likely torc fragments. The discovery comprised 1,494 Iron Age gold and silver coins, mostly of the Western regional series, struck *c.* 40 BC–AD 50 (Hurst and Leins 2013).

1. Short length of thick, coiled, gold/silver alloy wire, cut at both ends. Probably originally part of a multi-strand torc neck-ring. Surface XRF carried out as part of the Treasure process indicated a composition of 67% gold, 32% silver and 1% copper.
2. Fragment of gold/silver alloy sheet, possibly from a tubular torc. The sheet takes the form of a rectangular strip which tapers and is pierced at both ends.

Torcs of unknown type and/or location

55. Dorchester, Dorset

Smith recorded an iron torc from Dorchester but its whereabouts are unknown and we have no detailed description of the artefact (Smith 1905, 138). It is possible this is a mistaken reference to the iron torc from Spetisbury, Dorset (see above).

56. Arras, East Riding of Yorkshire

A copper alloy torc said to have been five and a half inches (140mm) in diameter (Greenwell 1906, 275) was discovered in burial A5 at the Arras cemetery (Stead 1979, 80 and 98). The burial also contained nine small jet beads and a copper alloy wheel ornament (Greenwell 1906, 301). According to an account in a letter by a Dr Hull (noted by Greenwell 1906, 275), the torc was found around the neck of the individual it was buried with. The torc was not illustrated and is now lost. Unfortunately, there is no detailed description of the torc.

57. Birdlip, Gloucestershire

A gold alloy multi-strand torc fragment recovered from Birdlip in 1947 may have been a grave good from one of the nearby burials (Staelens 1982, 21). There is no clear account of its discovery and it is now lost, but an illustration survives (Green 1949, 188, fig. 1a). This appears to show part of the neck-ring of a multi-strand torc formed from three wires plied together. There are wire knots or similar forms of

ornamentation equally spaced along the remaining length. One end is broken, whilst the other appears to have the surviving remains of a solid wire loop terminal.

58. Marham, Norfolk

An account of the discovery and a brief description of a torc found at Marham, Norfolk, thought to have been discarded, was recorded by Natasha Hutcheson (2004, 43): 'The example from Marham, which unfortunately was thrown away (SMR 0855) ... was described as being similar to the North Creake and Sedgeford examples and the "best Snettisham" torc. Given that the reference to the Marham torc was made in 1966, it is likely that the torc referred to is the Great Torc from hoard E.' The location of the find is a low-lying valley within a gently undulating landscape (Hutcheson 2007, 360).

59. Narford, Norfolk (TT 132)

Natasha Hutcheson (2004, 43) reported the find of several gold/silver alloy multi-strand torcs at Narford: '... part of a buffer terminal torc, which was partly melted and had fragments of twisted bar and loop terminal torcs fused to it, was recovered by metal detector in 1980–81. A complete elongated loop terminal torc was subsequently recovered from Narford, as were a number of wire fragments (SMR 3974). Unfortunately, none of the material from this site went to the local museum, it was recovered at night and then sold to an antiquities dealer, consequently there is no illustration, photograph or full report on these artefacts' (Hutcheson 2004, 43). The Narford torcs were found within 200m of the River Nar (Hutcheson 2007, 361).

60. Pattington, Staffordshire

Found in 1700, no further details known (Ellis 1849, 176).

61. Mildenhall, Suffolk

A gold torc was reportedly found in 1812 in an extended inhumation burial also containing two horses. The torc is said to have been melted down by a silversmith at Bury St Edmunds. Other grave goods included an iron sword and a 'celt' (Bunbury 1834, 610; Fox 1923, 81, 86; 1958, 10–11, 20; Clarke 1939, 43; Stead 1965, 9; Sealey 1979, 175).

62. Wallingford, Suffolk

Location: Unknown

Five gold torcs are reported to have been ploughed up on the Henham estate (grid ref. TM4478) perhaps in the 1930s. Thought to have been made of brass, they were slung in a ditch. The discovery is recorded by the Suffolk HER and was reported by an old man to M.J. Hardy of Metfield in 1984 (HAM 036, https://heritage.suffolk.gov.uk/Monument/MSF458). Apparently, a boy had kept one and put it on his bicycle, but he later sold it to a scrap metal merchant.

63. Rawden Billing, Yeadon, West Yorkshire

Found in 1781 (Whitaker 1816). Few details known, although from the description of the torc as 'consisting of two rods not quite cylindrical but growing thinner towards the extremities and twisted together', the object is perhaps more likely to be Viking period in date.

Unprovenanced torcs, possibly from Britain

64. Location: British Museum (OA.10883)

Gold alloy tubular torc with buffer terminals. The neck-ring is knotted on one side (James and Rigby 1997, 46, fig. 54). It was in the British Museum collections as early as 1846 but no provenance is known (Birch 1846, 31). Smith (1905, 56) originally suggested the torc was probably from France but later amended this to 'without locality' (Smith 1925, 62). Nonetheless, the torc is often viewed as continental, as is evidenced by its inclusion in Jacobsthal's catalogue of European Celtic art objects (1969 [1944], 169, no. 40, pl. 33). Hautenauve (2005, 256, no. 228) included it in her catalogue of British torcs, citing similarities with some of the tubular torc fragments found in Hoard F at Snettisham.

65. Location: Unknown

Gold/silver alloy multi-strand torc or bracelet with single-loop terminals, sold at Christie's, London, 7 December 1994, lot 172 (Anon. 1994, 91). The neck-ring or body is formed of two thick, circular-section wires plied together, and the terminals form continuous loops with these wires. The torc/bracelet is distorted into a loose spiral, with one of the loops overlapping the other. The auction catalogue states that the gold content of the object is '97% pure'.

Chapter 23
Interpreting Snettisham: What do Hoards 'do'?

Jody Joy and Julia Farley

This chapter focuses on the Snettisham hoards asking what hoards do and exploring their potentially transformative effects. Above all it is concluded that, although the deposits are clearly related, it is not productive to view the Snettisham hoards as a whole, as a single 'treasure'. Each hoard is different, with different collection and depositional histories. Individual hoards 'did' something different. They are of course related: they were all deposited in an appropriate place of importance. We argue that when interpreting hoards in archaeology we should approach them as a related and useful category, but from the perspective of individual depositional events with their own distinctive identity and narrative.

The chapter is divided into two main parts. The first examines the phenomenon of hoarding more broadly, it explores previous interpretations of the deposits at Snettisham, and gives a detailed examination of the structure of the individual hoards. The second presents a model for understanding the social role of hoarding at Snettisham in terms of a shift from a 'world of torcs' to a 'world of coins'.

Interpreting Snettisham: what do hoards 'do'?

Approaching hoards

Bradley defined hoards as 'collections of buried objects that were apparently deposited together on the same occasion' (Bradley 2013, 122). Hoards are found throughout many parts of the world, and across broad expanses of time. In Europe, it is possible to trace a continual sequence of hoarding lasting 5,000 years (Bradley 1996, 306). Despite its longevity and variety, general explanations of hoarding have remained oddly consistent in the 150 or so years since the phenomenon was first identified and discussed (Fontijn 2002, 15–19, table 2.3). Debates have primarily centred on motivations and intentions. For example, were hoards deposited for safekeeping, with the purpose of later retrieval as is so famously exemplified in Samuel Pepys's diaries? If so, why did so many hoards go unrecovered (Fontijn 2002, 14)? And why are there identifiable patterns in the location and contents of deposits?

In recent decades, long-standing assumptions about hoards have seen significant challenge and revision. For example, the division between hoards and single finds has been questioned (Bradley 2013), as have the distinctions often made between dryland and watery deposits (Yates and Bradley 2010a; 2010b). As Strang (2005) cautioned, there are many 'different kinds of water'; with artefacts deposited in rivers, lakes, meres and bogs, distinctions between dry and wet are sometimes difficult to reconcile. More broadly, much discussion has taken place over the use of 'ritual' to describe practices perceived as above and beyond functional necessity and that defy explanation from a modern-day perspective. As Brück (1999) and Bradley (2005) have both argued, this creates an opposition between ritual and everyday activities which might be artificial, or at least anachronistic. The dominance of metalwork in discussions of hoards has also been noted. For example, a class of ceramic hoards has been identified in Central Europe consisting of deposits of fine vessels (Bradley 2013, 121), and in faunal studies there has

been much discussion of 'Articulated/Associated Bone Groups' as often representing intentional deposits (Hill 1995; Morris 2010). Finally, Joy (2016) argued that owing to the concentration of discussion on questions of motivation and intentionality, too much attention has been paid to the moment of deposition as opposed to the collection and accumulation of artefacts (exceptions cited by Joy include: Dietrich 2014; Garrow and Gosden 2012, ch. 5; Hansen 1996–8).

Iron Age hoarding

As Joy has highlighted (in Baldwin and Joy 2017, 107), with the notable exception of Haselgrove (2015) and Wilkinson (2019), the examination of hoarding practices has occupied a marginal position in Iron Age studies compared to the extensive literature on Bronze Age hoards. Discussion has tended to focus on deposition at individual sites, on regional surveys (e.g. Hunter 1997; Hutcheson 2004) or on specific artefact types and materials (e.g. Haselgrove and Hingley 2006; Hingley 1990; 1997; 2005; 2006; Joy 2014). Mirroring the trends identified above, interpretations of Iron Age hoards have shifted over time from deposits intended for safekeeping and later retrieval to examples of votive deposition. Few though have considered further what votive deposition might entail. A notable exception is Sharples (2010, 96–7) who, following Godelier's (1999, 155) account of potlatches undertaken by the people of the north-west coast of North America, argued that hoarding created relationships between people and gods through the conspicuous consumption and mass destruction of objects. Fitzpatrick (2005) also discussed the idea that damage to objects could enable the transfer of metaphysical essence.

Owing to the identification of deliberate deposition in varied domestic contexts, particularly pits (e.g. Hill's ground-breaking (1995) study centred on Wessex, see also Cunliffe 1993; Sharples 2010), hoards have tended to be subsumed into a wider category of deliberate or special deposit. As Garrow and Gosden (2012, 157) argued, this has created significant 'blurring of the boundaries' between different types of deposition. Haselgrove (2015) also suggested that no rigid distinction should be made between hoards and other types of deposit. Related to these ideas are wider concerns already identified with the potentially artificial distinctions made by prehistorians between ritual and the everyday (Brück 1999; Bradley 2005).

In sum, the term 'hoard' is clearly problematic and encompasses a huge range of different motivations and behaviours. Nevertheless, the practice was long-lasting and widespread, and the idea of the hoard remains a useful category as long as each one is treated as a discrete deposit with a unique collection and depositional history, rather than attributing universal motivations and explanations. The perspective adopted here is that, as Garrow and Gosden (2012) neatly expressed it, hoards '…brought groups of artefacts together and might in the process also have brought groups of people together, in some cases at least' (*ibid.*, 191). Whatever the intentions and motivations behind their deposition, hoards also provide 'snap shots' or 'time traps' of networks of people, places and things. They provide a window on past relationships, a rare instance in which these survive into the present, albeit in a stage-managed manner (Garrow and Gosden 2012, 156; Joy 2016, 242; see also Wingfield 2013, 80).

A history of interpretations of Snettisham

Before presenting a more detailed examination of the Snettisham hoards, it is first necessary to briefly discuss how they have been interpreted in the literature. In his publication of the earlier finds and excavations at Snettisham (including Hoards A–E), Rainbird Clarke (1954, 70) interpreted the discoveries as smiths' or founders' hoards. As justification, he cited the valuable and portable nature of the material, as well as the hammering, working and dismemberment of the objects, which he related to the activities of metalworkers. According to Clarke, 'the Snettisham treasure, then, may represent the culmination of a successful business career, the banking in the ground of the accumulated acquisitions of a lifetime' (*ibid.*, 70). Two other possibilities were also put forward by Clarke (*ibid.*, 71): that the material was the possession of 'aristocratic refugees' from south-east England; or loot accumulated through raiding. All three of his interpretations were based on the opinion that many of the objects from Snettisham were manufactured outside of Norfolk because at the time the only other torcs found nearby for Clarke to consider were those from Bawsey and North Creake (see Gazetteer in Ch. 22). He therefore had to account for how the material got there, either via mobile craftspeople, refugees, or through tribal raiding. The idea that some of the objects reached Norfolk in the form of gifts was also considered (Clarke 1954, 70). Whilst it is undoubtedly true that many of the finds from Snettisham (including the potin coins, and the Gallo-Belgic coinage) came from outside Norfolk, subsequent discoveries have revealed a high concentration of torcs and related finds in north-west Norfolk, rendering much of Clarke's considered argument obsolete for the bulk of the objects represented at the site, many of which may well in fact have been locally made.

Thirty-five years later, in his interim report on the British Museum excavations at Snettisham, Stead (1991a, 463) maintained Clarke's position that the hoards were deposited for safekeeping. He suggested that: 'perhaps they should be seen as a gradual accumulation of wealth – a veritable treasury. The quantity of the treasure was the possession of more than one individual – perhaps a family, or even a tribe.' Elsewhere Stead reiterated his position: 'the entire treasure, some 20kg of silver and 15kg of gold, is surely more than the savings of an individual and must represent the wealth of a community. Perhaps it was a tribal treasury' (Stead 1996, 49).

Much of the popular literature has followed Stead's interpretation (e.g. Hobbs 2003, 137–43). Others have suggested the hoards were buried for safekeeping ahead of Caesar's invasions (e.g. Rodwell 1976, 198–203; Cunliffe 1991, 120), or they have drawn on the potential significance of the choice of location for deposition, situated on a conspicuous promontory overlooking the Wash (e.g. Hutcheson 2011, 44).

As Stead's interpretation has been so influential, it is worth detailed consideration here. Stead did consider the

possibility of a votive interpretation, noting accepted Iron Age votive deposits from watery contexts and sanctuary sites. However, he correctly pointed out that watery deposits, 'only very rarely … include a torque' and that in Britain 'votive deposits in Iron Age sanctuaries at Hayling Island, Hampshire, and Harlow, Essex, do not seem to have included a torque, nor do they feature collections of other artefacts buried in small pits' (Stead 1991a, 462). He does not dismiss the possibility of offerings in the case of other, smaller torc hoards found elsewhere: 'None … was found at a known temple site, and none was associated with undoubted votive deposits, but it is still possible that they had been offerings' (*ibid.*, 459). Despite this, he came down in favour of a 'treasury' or savings hoards at Snettisham for a number of reasons (*ibid.*, 459–63). These included the restricted range of artefacts (especially when compared to the broad range of finds from some contemporary sanctuaries and temple sites such as Hayling Island), the inclusion of objects at a range of different stages, from apparently unfinished pieces to 'scrap from the metalsmith's workshop', which he suggested 'seems unparalleled in an Iron Age votive deposit' (*ibid.*, 463), and the fact that the hoards were hidden, with the pit deposits structured according to metal content: 'The disposition of Hoard L suggests that some of the more precious [gold-rich alloy] items were given greater protection, with a less valuable [copper and silver-rich] "decoy" hoard nearer the surface' (*ibid.*, 463). In sum, he argued that, 'although the suggestion that the Snettisham hoards belonged to a treasury leaves some questions unanswered, it is more satisfactory than the votive explanation … The hoards were surely hidden, and the presumption must be that whoever hid them intended to retrieve them' (*ibid.*, 463).

Although he acknowledged that it was possible the Snettisham hoards were offerings, Stead's core argument was somewhat circular: votive offerings are deposited in water or at sanctuaries and because the hoards (and indeed other torc finds) were not discovered in these contexts they are unlikely to have been votive. Emerging literature at the time advocated votive interpretations of dryland hoards, including so-called 'founders' hoards' (see especially Bradley 1990). Although he did refer to other torcs found nearby, Stead's (1991a) article understandably focused on the site of Snettisham itself, rather than considering its place in wider regional depositional practices. Subsequent scholarship (see Hutcheson 2003, 94) has emphasised that Snettisham fits into a pattern of 2nd and 1st-century BC dryland metalwork hoards across Norfolk, particularly at high points in the landscape overlooking rivers or the sea.

In a response to Stead's interim report, Fitzpatrick (1992a) promptly raised many of these issues. First and foremost, he suggested '... it is possible to make a stronger case for the Snettisham hoards being votive than Stead allows' (*ibid.*, 398). He went on to explain that the divisions between sacred and profane may not have been as distinct in the Iron Age as they are today. For Fitzpatrick, the interpretation that the Snettisham hoards represent a treasury therefore may not exclude the fact that their deposition was votive (*ibid.*, 396). He also questioned the influence of the primary concerns of the Treasure Trove law on Stead's interpretation, as the focus of Treasure Trove at the time was to distinguish between burial with the intention of retrieval and other types of deposition (Longworth 1992, 337). These perspectives, he argued, have no relevance to the actions and intentions of people in the past (Fitzpatrick 1992a, 398).

Subsequent discoveries have also changed the picture at Snettisham: Stead's initial interpretation was made before his subsequent seasons of excavation revealed the large enclosure ditch around the 'gold field'. Writing on the subject of Celtic art, Stead later stated: 'It is likely that the ditch was constructed sometime after about AD 100, more than a century and a half after the torques had been deposited. It is tempting to relate the enclosure to the torques that were found near its centre; the ditch was not an impressive defensive work but might have defined an area that had had more formidable defenders, such as ghosts or gods. Whatever its function, the Snettisham site lost its significance in the 1st century AD and the Britons never recovered their treasure' (Stead 1996, 49–50; see also Stead 1995a, 110). It is notable that in this later interpretation there is also consideration of ancient beliefs or superstition. In a similar vein and considering Norfolk torc hoards more generally, Cunliffe stated: 'the strong probability is that these depositions were made within ritual contexts, but only at Snettisham is it possible to begin to define something of the ritual nature of the larger site where the hoards were found' (Cunliffe 2005, 197).

More recent interpretations of Snettisham, which we follow here, have sought to place the discoveries within their wider regional, spatial and temporal context (Chadburn 2006; Davies 1996, 87; 2008, 100–6; Hutcheson 2003; 2004; 2007; 2011). For example, John Davies (1996, 87; 2008, 100–6) saw west and north-west Norfolk as a focus of political power in the early decades of the 1st century BC. In addition to a concentration of elaborate metalwork hoards, he viewed the presence of earthworks and other sites as evidence that this part of Norfolk was probably a focus of maritime trade, with Snettisham as a centre of religious activity of importance to his 'north-west zone' of Norfolk. Joy (2015, 155) also argued that Snettisham's location and aspect were possibly propitious to Iron Age beliefs, citing Steven Willis (2007, 120–1), who noted that a number of Late Iron Age sites interpreted as shrines were located on higher ground overlooking the point where freshwater meets the sea. Joy suggested that siting an important religious site close to the coast may have referenced contacts across the sea: presumably the sources of some of the precious metals used to make torcs, in the form of scrap and coins, and possibly the origin of some of the torcs from the hoards. Interestingly, the Snettisham hoards were not positioned facing the sea, but rather oriented towards the surrounding landscape (Ch. 3): the location was meant to be seen, but with the promontory of Ken Hill and the coastline in the background.

Hutcheson (2003; 2004, ch. 6; 2007) also placed the Snettisham finds within their regional context. Like Davies, Snettisham was not her primary focus. She argued that during the later Iron Age, metalwork was deposited in high places in north-west Norfolk, isolated from settlement. In

contrast, where present, human remains and settlements were located on land below 30m OD. Hutcheson also noted patterns in deposition, in particular the inclusion of fragments or 'scrap' in many hoards. In essence, she identified 'rules' of deposition, specific manners in which it was appropriate to deposit particular artefacts. Put succinctly, Hutcheson argued that 'the landscape was structured' (Hutcheson 2003, 95). Like Davies (1996; 2008), Hutcheson (2003; 2007) observed a number of chronological changes in the archaeological record. Towards the end of the 2nd century and ending sometime around 60 BC, north-west Norfolk was the focus of torc deposition, particularly in locations overlooking rivers and adjacent to the Wash. The first coin hoards in the region contained Gallo-Belgic gold coins, but after *c.* 50 BC coin hoards became dominated by local gold issues. After *c.* 20 BC, silver coin hoards were most prevalent, and these were distributed more broadly throughout Norfolk. Davies (1996; 2008) also recorded this shift in the nucleus of activity away from the north-west of the county, not just visible through the deposition of metalwork, but also the location and distribution of settlements. We see this shift away from a focus on north-west Norfolk as important for the changes in deposition that occurred at Snettisham. The 1st-century BC deposits from the site are unique in scale, but later hoards are far more restricted in number and fit into the wider pattern of deposition across Norfolk rather than representing an exceptional regional focus.

Another distinction discussed by Hutcheson (2007, 361) was that between hoards of torcs and single deposits. She noted a correlation between findspots that have been further investigated and those that have not: sites that are excavated often turn up more finds. Most single finds are therefore from sites which have not subsequently been investigated by archaeologists, meaning that single finds may reflect patterns of recovery rather than deposition. The only notable exception to Hutcheson's observation is the Newark Torc, found in Nottinghamshire, where archaeological investigation of the findspot revealed no further finds. But, whilst this torc is of a similar type to Norfolk finds and could have originated in East Anglia, its location is outside of both Hutcheson's study area and the main distributions of such torcs, and thus its making, acquisition, use and deposition may have followed a different trajectory. It is also unclear, as already discussed, if any distinction was drawn between single and multiple deposits in ancient times (Bradley 2013): both involved selecting a location, digging a hole and placing something in the ground. The only major difference is the accumulation of material required before deposition. Contrast, for example, the deposition of a single torc versus the vast collection of artefacts contained in Hoard F.

In sum, although Stead's carefully reasoned account of Snettisham is still popular, many others view it as a religious site or interpret the deposits as votive, though often without much further explanation. Only Davies and Hutcheson offer further thoughts as to what was happening at Snettisham, and where it is located within a broader context of artefact deposition and society. In short, Snettisham is viewed as a centre for ritual activity (Davies 1996, 87) and the concentration of depositional activity in north-west Norfolk between the late 2nd and early 1st centuries BC is seen as reflecting the prominence of a single group, whose success was supported through trade and the acquisition of notable quantities of gold (Hutcheson 2004, 94). As both Davies and Hutcheson examined Norfolk in general, they inferred changes in society from broad trends in the archaeological record rather than closely examining the differences and variation between individual deposits. Here we are able to focus more closely on the different acts of collection and deposition evidenced at a single site. In addition, we will further explore the question of what hoards do, and the potential roles of hoarding in emphasising and consolidating power in the region. This is an aspect that, as Garrow and Gosden (2012, 184) observed, has not been extensively discussed by Davies or Hutcheson.

The nature of the Snettisham hoards

The Snettisham hoards are quite diverse, ranging from only two objects in Hoard D to over 500 in Hoard F. In the following analysis, the Snettisham hoards are viewed as a set of individual (but related) deposits rather than a collective treasure. Nevertheless, it is possible to identify patterns and draw similarities between the hoards. Of those hoards containing torcs, two main types can be identified: tightly packed groups or nests of torcs and hoards made up primarily of fragments (Stead 1991a, 455; Joy 2016, 243). Hoards A, G, H, J, K and L belong to the former and Hoards B, C and F to the latter. Hoards D and E each consist of a single complete torc with (an)other item(s) interlinked through the terminals, and other individual complete torcs were also found in 1964, 1968 and 1973 (Cat. Nos). It is harder to ascribe these finds to either group, but Stead (1991a, 450) suggested that they might have been from 'similar hoards [to G, H, J, K and L], some perhaps from the hoards now discovered'.

Fragmentary hoards

Of the fragmentary hoards, it is now impossible to separate out exactly the contents of Hoards B and C because the objects have become intermixed (Clarke 1954, see Ch. 14). Similarly, because Hoard F was recovered by a metal-detector user, the exact arrangement of the objects in the ground was not recorded, although we know that at least some of the artefacts were contained in a copper alloy helmet (see Chs 8 and 12, and entry for F.445 in Ch. 14). Some relationships between objects can, however, still be inferred, either because they are still linked or where there is a record that they were formerly associated.

As is outlined in Chapter 20, many of the artefacts from all three fragmentary hoards were subjected to a number of different destructive processes before deposition. Broken objects include fragments of torcs and bracelets, and Hoards B and C in particular include broken-up ingots and numerous fragments from simple rectangular-section rings. Examination of broken and deformed edges has revealed evidence for deliberate cutting, bending, squashing and twisting (Ch. 20). Thicker wires or strips were often struck with a sharp-edged tool, possibly a chisel. Some thinner wires have triangular-shaped edges, implying they were cut from both sides, probably by a pair of snips. Other thin

Figure 23.1 Tubular torc fragment F.32 with twisted wire fused onto it

Figure 23.2 F.25a–j: Linked group of small rings

wires, and potentially some of the rectangular-section metal strips, were repeatedly twisted and bent until they snapped.

In contrast to breakage, some fragments, particularly from Hoard F, were fused together into lumps or onto the ends of different objects by partial melting, in effect creating new artefacts or combinations. In many instances a contrast seems to have been sought, for example by fusing simple twisted wires onto a decorated tubular torc fragment (**Fig. 23.1**).

Interlinking is another quality of fragmentary hoards, whereby objects form small but distinct collections or assemblages within the larger whole of the hoard. In its simplest form objects such as groups of rings were linked together by looping (**Fig. 23.2**). Sometimes one object was inserted into another: wires were inserted into tubular torc fragments in groups F.29 and F.30, and five coins were carefully sealed inside tubular torc fragment F.53. Attaching various broken artefacts, particularly torc terminal fragments, onto a large ring was another method employed to create such a group or collection (**Fig. 23.3**). Exact methods of attachment vary, but include looping the ring through the terminal of a torc, through a bent loop of wire, or through rough perforations (especially in the case of tubular torc fragments). There are more than 20 of these collections in Hoard F, and the number of objects in each group ranges from two to the low teens. Their nature varies quite widely but often they are made up of heterogeneous objects with different alloy compositions and a range of colours (**Fig. 23.3**). Whilst the general tendency is towards diversity, there are a handful of cases of very similar interlinked rings (F.25–F.28; **Fig. 23.2**) and sometimes similar fragments are grouped together, even when they are from different torcs, such as the pair of slightly mismatched tubular torc terminals in groups F.1 and F.2 (**Fig. 23.4**). There is also limited but tantalising evidence in the fragmentary hoards for the production and processing of metals, such as the scale pan folded into quarters from Hoard B/C (B/C.23) and the possible wire-sizing stone from Hoard A (A.8). These hoards also contain ingots and small amorphous metal lumps that seem to have solidified from a molten state without being further processed.

Gosden (2013, 46) described Hoard F as a 'nested set of relationships'. One way in which these relationships were manifested is through the selection and arrangement of objects included in the hoard. Examining Hoard F from the perspective of collecting and accumulating objects, Joy (2016) speculated that some of the interlinking occurred as part of the process of gathering artefacts for inclusion in the hoard, physically creating connections between them. He also suggested that these linked artefacts and collections might provide clues as to how a large assemblage like Hoard F was gathered. Citing Late Bronze Age hoards from the Carpathian Basin which contain groupings of artefacts within a larger hoard (Dietrich 2014, 479–80; Hansen 1996–8, 19–23), Joy (2016, 247) suggested that these collections could have been gathered by individuals or groups before being incorporated into the larger

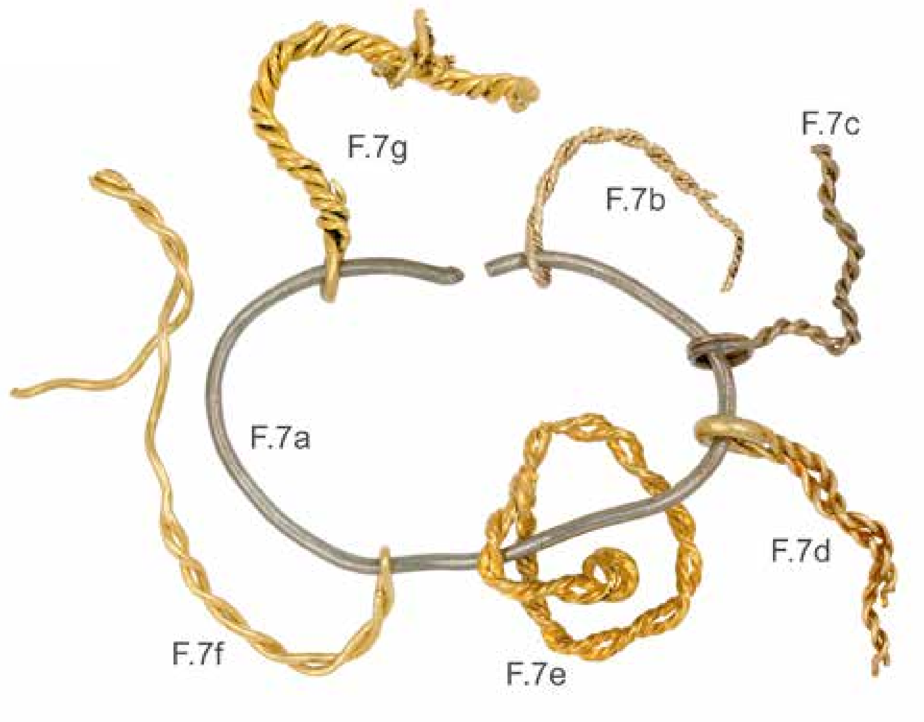


Figure 23.3 F.7a–g: Group of torc/bracelet fragments looped onto a large ring

Figure 23.4 F.1a–e: Group of artefacts looped around a large ring

assemblage, representing contributions to a greater whole. Joy speculated that the sets of small rings (potentially finger or toe-rings) present in some of the fragmentary hoards (e.g. F.25–F.28), '… could have been gathered from various family members, or wider social groups, before being incorporated into the larger collection, explaining the variations in the diameter and form of these rings… personal gifts towards the collection were linked together to represent broader social groupings and a collective effort' (Joy 2016, 247). Loops of rings could also represent how they were worn or displayed, collected and linked together rather like glass beads on a string. Like a bead necklace, these could be added to or objects taken away (Giles 2012). Similarly, the hoards were not static and artefacts could have been added or taken away at any point up until the moment of deposition. But, importantly, as suggested by Garrow and Gosden (2012, 193, 312), we can view hoards as a group or communal endeavour, much as Sharples (2010, 116–24) has argued for the construction of hillforts. Stead's notion of the Snettisham deposits as a 'tribal treasury' can be debated on two counts: the existence of 'tribal' societies at that time in north-west Norfolk and the idea that the Snettisham hoards represented a 'treasury' ready for later retrieval. But, Stead's argument that the Snettisham hoards represent too much material to be the result of the activities of a single individual is fully endorsed here. The hoards must have represented some form of communal enterprise in terms of the gathering and collecting of resources to acquire material for deposition. Indeed, it is possible that one of the reasons why so many hoards were deposited at the same site is because of competition, as different households and groups attempted to outdo each other through the material that was collected and deposited in individual hoards. But, the fact that they returned to the same location to do this also suggests some kind of overall goal or motivation, and lying behind this, the site at Ken Hill must have been significant for people to gather there, or to keep returning.

It is likely that, over the long period that torcs were being made, worn and used, from at least the 3rd to 1st centuries BC (see Ch. 22), torcs were sometimes broken up and recycled into other torcs. Thus, in theory, the type of assemblage represented by Hoards B, C and F could have been part of the standard materials in the care of a metalworker or workshop, ready to be converted into new objects. This is certainly possible but, were this the primary mechanism through which such assemblages had been gathered, we might expect to see multiple parts of the same broken object in different interlinked groups. In fact, whilst the fragmentary hoards do contain some objects clearly broken into multiple sections (as indeed does Hoard K, see K.3), there have been no joins established between hoards or between interlinked groups. Thus, it appears that when part of a torc or bracelet was assigned to a hoard or an interlinked group, something else happened to the rest of the object (whether it was immediately recycled, gifted or exchanged, or separated out for storage or deposition elsewhere). This seems to support the idea that there was a particular end in mind for these interlinked groups, most likely storage, display or deposition, which differed from the fate of the rest of the object.

This connects to a final aspect of the fragmentary hoards, also highlighted by Fitzpatrick (1992a, 396; 2005) and Joy (2016, 247): their potential transformative effect. As the Snettisham torc hoards were likely deposited in the mid-1st century BC, a time when many torcs were probably being broken up and recycled into coins (see below), perhaps the fragments were given as a part which was taken for a whole, or *pars pro toto*, freeing up the rest of the physical object to be reworked or recycled. This is a practice known from Archaic Greece and has been suggested for Bronze Age hoards (Hansen 2013, 180). Rather than passively reflecting the activities and products of metalworkers as the terms founders' or metalworkers' hoard implies, it is possible that some of the accumulations of objects deposited in fragmentary hoards were intended to represent the transformative activities of metalworkers. As is suggested in Chapter 20, the variety of fragments included in many of the bundles in Hoard F (e.g. **Fig. 23.3**) showcase the breadth of torc production traditions. The deposition of these objects may have signalled a closure to these activities.

In Chapman's work on the Neolithic Balkans (2001; see also Chapman and Gaydarska 2007), he contended that people selected fragmentary objects for use in exchange and as a means of linking people, objects and places through what he called enchainment. A further aspect to his work, which has received less attention in archaeology, is his related category of accumulation, whereby other objects were gathered into sets which generated different types of relations. At first sight, Chapman's model seems to fit well with the objects from the Snettisham hoards. There is abundant evidence for the deliberate fragmentation of objects, as well as accumulation through the creation of sets or collections of artefacts as hoards, and also within hoards. We would not argue with Chapman's theory as a plausible explanation of material from the Balkan Neolithic, but following Brittain and Harris (2010), we do express caution in terms of mapping his model onto Iron Age Norfolk. Whilst being influenced by Chapman's work, the following analysis will therefore examine what fragments do, especially their transformative qualities (Brittain and Harris 2010, 589). As we have seen, collections of fragmentary material have historically primarily been interpreted as metalworker's hoards (e.g. Clarke 1954). But looked at from

the perspective of gathering and transforming, they can also be interpreted as a form of offering connected with making, processing and recycling artefacts (Joy 2016, 247), as they contain objects at a variety of life stages, ranging from incomplete or unfinished torcs to broken-up fragments, all potentially representing the activities of metalworkers. A representative sample of bits of objects collected and curated for final deposition could act as offerings whilst also referencing re-processing and re-purposing. This form of deposition may have acted to validate the replacement of torcs by coins (see below). Both parts of recycling are cited: the breaking up of artefacts and the re-forming of material.

Hoards of 'nested' torcs

'Nested' torc hoards are more frequent at Snettisham (though they account for a much smaller total number of objects). They include Hoards A, G, H, J, K and L. Fortunately, most of these were excavated by Ian Stead and his team, so we have a good understanding of the arrangement of the objects in the ground (see Ch. 12).

These deposits are distinct from Hoards B, C and F in that they consist primarily of complete or near-complete objects which, at the time of burial, could still have been worn. The distinction is not entirely clear-cut; almost all of the nested hoards also contain objects which were deliberately broken, and only part selected for deposition, or (especially in Hoard L) so heavily damaged that they would have been difficult to wear. It is difficult to ascertain for certain in some instances, especially the disturbed hoards where burrowing has displaced many fragments, but it appears that torcs G.2, G.15 and G.16 were incomplete at the time of burial. Hoard H seemingly consisted only of complete objects (though one, H.3 is either unfinished or damaged, with only simple 'hook' terminals, hammered flat). In Hoard J, group J.5 (laid over two complete torcs, J.6–J.7) comprised two half-torcs, each deliberately cut at the back of the neck-ring. A length of broken copper alloy torc had been threaded through their remaining loop terminals. Hoard K contains at least one torc which had been deliberately cut up into small pieces (K.3). Hoard L is discussed in more detail below, but the lower deposit included a torc/bracelet where the terminals had been partially untwisted (L.8), half of a broken gilded copper alloy torc (L.9), and two gold alloy torcs that had been deliberately broken and only around half of each deposited (in one case, L.15, partially melted at the end, and in the other, L.16, showing a clear cut across the back of the neck-ring). The 'Grotesque Torc' L.19, with its extensive repairs incorporating fragments of other objects, could be considered a composite group, and L.10 also had two lengths of cut gold alloy wire inserted through one of its terminals. Torcs L.20 and L.21 were damaged or fragile and would have been difficult or (in the case of L.20) impossible to wear in their current state.

In most instances of nested hoards, torcs were placed one on top of the other, tightly packed into relatively small holes. Torc H.7 had even been compressed to fit into the hoard pit, but sprang back into shape once it was removed (Stead 1991a, 450; Ch. 12). Stead (1991a) noted that many of the nested hoards were arranged according to material, with gold alloy objects at the bottom and silver artefacts towards the top (*ibid.*, table 1). He argued that, 'the disposition of Hoard L suggests that some of the more precious [gold alloy] items were given greater protection, with a less valuable [silver alloy] "decoy" hoard nearer the surface' (*ibid.*, 463). As is argued above, we cannot be certain how Iron Age people valued different materials and whether gold was more highly esteemed than silver, as it is today. Taking this into account, Hutcheson (2007, 362) suggested that rather than material properties, this arrangement could equally have been based on colour, with, 'the more silvery near the top, the more golden near the bottom (gold and bronze)'. The significance of colour and metal content are likely, of course, to be closely interlinked, and the placing of golden-coloured and/or gold-rich objects closest to the base of the hoards could have been connected to the symbolic associations of this colour as well as pragmatic concerns about safekeeping.

Nevertheless, as is often the case at Snettisham, the reality is complicated and varied. **Figure 23.5** shows a simplified schematic representation of the hoards ordered by colour, which is closely related to surface metal content (note that, as described in Ch. 17, surface enrichment means that the metal content at the surface is not representative of the ancient alloys used to make the torcs). There are slight differences in the ordering presented here compared to Stead's interim report (1991a). These are due to the fact that in **Figure 23.5** interlinked groups have been dealt with as a unit, and torcs are shown in order of deposition (as far as can be reconstructed, see Ch. 12), rather than reverse order of recovery. In a small number of cases, subsequent conservation work slightly altered the number of torcs identified in each hoard, or scientific analysis identified additional examples of gilding.

Broadly speaking, some ordering by metal content can be observed, especially in the placement of the gold-rich alloy torcs towards the base of Hoards J, K and L, as noted by Stead (1991a). As Hutcheson (2007, 362) suggested, golden-coloured copper alloy and gilded copper alloy torcs are perhaps slightly more likely to be grouped with the gold alloy examples, but this varies by hoard. In Hoards J, K, and the lower pit of L, metal content appears most significant, with copper alloy and gilded torcs appearing immediately above silver-rich alloy (in the case of K and the lower pit of L) and gold-rich alloy torcs, with the highest-gold alloys towards the base of the pits. The upper pits of Hoards G, H and L, in contrast, contain a mixture of silver-rich and copper alloy torcs, some gilded, with no hard and fast divisions based on colour or metal content. In the lower pits of Hoards G and H, colour appears more significant than metal content, with each containing a single silver/gold alloy torc as the uppermost piece (in each case silvery-gold in colour, but the most impressive and gold-rich torc from either hoard), above a group of (originally more golden-coloured) copper alloy and gilded copper alloy torcs, with a mix of alloys in the rings present at the base of Hoard G.

Overall, the picture is more complicated than previously suggested, and (particularly outside of Hoard L) it seems likely that neither colour nor metal content was the strongest guiding principle behind the structuring of the hoards. If

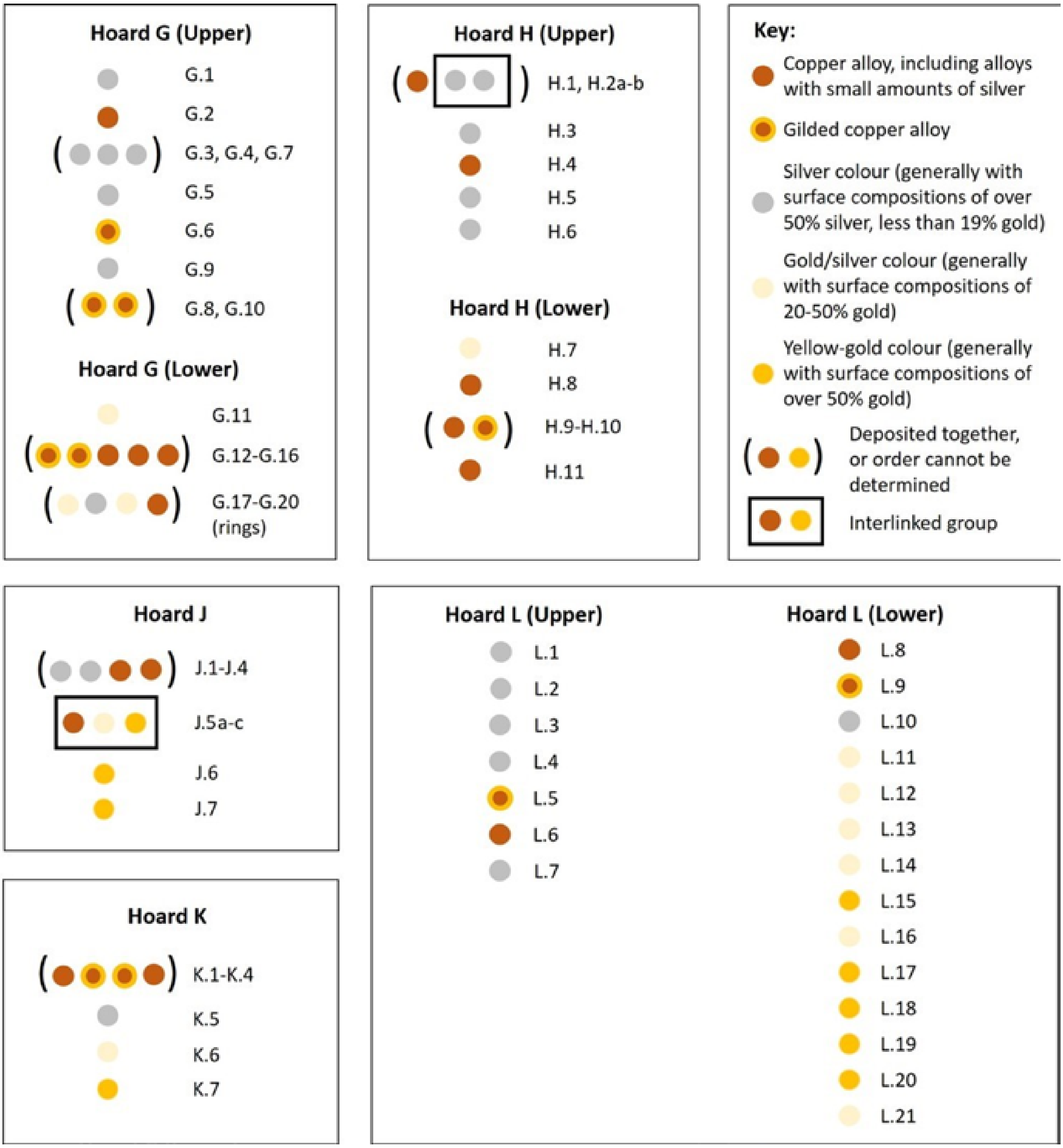


Figure 23.5 Schematic representation of the hoards in order of deposition, coded by colour. All objects are multi-strand torcs, bracelets or fragments, except the four large rings noted in Hoard G (G.17–G.20). Generally, the colour assigned is based on surface metal content according to XRF analyses carried out by Duncan Hook (see Stead 1991a, table 1). This was updated where new information was available, or (in the case of L.11) where this differed significantly from the visual appearance of the torc

anything, there seems to have been an attempt to represent a broad range of colours and alloys in each hoard, a concern also reflected in the collections of artefacts found within fragmentary hoards, many of which similarly cover a broad range of hues, from silver to golden yellow.

In order to more fully understand the hoards, they need to be considered in detail, and as separate individual deposits. Two hoards, G and H, are quite similar, and their structures could be seen to reference one another. The excavation images of these hoards are included in Chapter 12 (for G see **Figs 12.5–17**, and for H see **Figs 12.18–31**). In each case, a pit was dug, and the simplest, least complicated objects were placed into the bottom. In Hoard G this was a group of large rings (possibly bracelets) in a variety of alloys, likely followed by G.14, a very simple two-strand ring terminal torc. G.14 is one of the smallest torc from the hoards, possibly sized to fit an adolescent (see Chs 13 and 22, internal circumference approx. 282mm), and is unusual in being twisted Z-twist (the opposite direction to almost all other Stage I torcs at the site, apart from K.5 and a group from Hoards B and C, see Ch. 20). In Hoard H the first object placed was H.11, a simple torc very similar to G.14,

and also with a small internal circumference (around 338mm, again one of the smallest from the hoards, see **Fig. 13.1**). In each case, above this were placed a small number of buffer terminal copper alloy torcs with coiled neck-rings (H.8–H.10, all apparently complete, and G.12, G.13, G.15 and G.16, some of them possibly damaged or incomplete). Next was placed the largest and most unusual torc in each hoard. In G this was G.11, a massive, silvery/gold-coloured torc with one of the largest internal circumferences of any from Snettisham (544mm). In H it was H.7, a slightly more golden-coloured but still silver-rich gold alloy torc with complex (Stage IV) multi-strand neck-ring and decorated ring terminals (internal diameter 509mm). It was so large it had to be compressed to fit into the pit. These deposits closed the lower pits of the hoards, and soil was backfilled over them.

Above the soil which closed the lower pit, an upper deposit was now carefully placed. In Hoard G, this upper component of the hoard took the form of ten torcs. First, two gilded copper alloy buffer terminal torcs (G.8 and G.10) were deposited together, then three silver-rich or silver/copper alloy ring or loop terminal torcs, one gilded and silvered (G.9, G.6 and G.5) were placed in turn, then three more similar torcs (G.3, G.4 and G.7) together, intertwined, and finally copper alloy buffer terminal torc G.2 and silver alloy ring terminal torc G.1. In Hoard H, the six torcs in the upper pit also consisted primarily of silver and copper alloy torcs. The lower four, all fairly simple loop or ring terminal torcs, were seemingly placed one by one (H.6, H.5, H.4 and then H.3). Closing the deposit, torcs H.1 and H.2 were placed together. H.1 is a simple buffer terminal copper alloy torc with coiled neck-ring, but H.2 is a more unusual example, consisting of two silver-rich alloy loop terminal torcs twisted together to make a single neck-ring. After the second deposits were made, the pits were closed.

It is difficult to make precise deductions from these patterns of deposition in Hoards G and H, but it certainly seems that these were carefully structured acts, and most likely performances designed to reinforce kinship ties, social networks or power structures. It is tempting to see the first deposits as representing a wide range of individuals. Whilst it is impossible to be certain, it seems highly unlikely that the small, simple copper alloy torcs placed at the bottom of each lower pit (G.14 and H.11) were worn by the same people as the large, elaborate gold alloy torcs that closed these lower deposits (G.11 and H.7). They might have represented different roles within a family or community. Or, if they were worn by the same person, they might be associated with different life stages. The fact that these objects seem to have been placed one by one conjures an image of a small group of five to six people standing around the pit, taking turns to step forward and place a torc (their own?) into the ground. Any larger audience would have struggled to see the moment of placement, but the order in which the deposits were made seems choreographed to echo and reinforce a social order, perhaps of authority or seniority. The act of covering up these deposits might have marked the end stage of this first event. The second act has a different feel, with a much narrower range of torcs represented: all plain, undecorated torcs with simple loop, ring or buffer terminals and either coiled or simple plied neck-rings. The precious metal torcs are all silverish rather than golden in colour and are mixed in with copper alloy examples. The variation in internal neck-ring diameter is less in the upper pits (380–498mm in Hoard G, 393–469mm in Hoard H), but still enough to suggest that a range of individuals must have been represented. If the order of deposition here was also calculated to reflect social hierarchies or different roles, then this is now hard to interpret. Whatever the case, the similarities between Hoards G and H emphasise that these nested torc hoards were not rushed or casual deposits, but planned events which surely held wider meanings for their participants.

Another, perhaps related, form of patterning is also apparent in Hoard L. Joy (2016, 247–50) noted that artefacts which appeared to be old at the time of deposition were found at the bottom of both the lower and upper pits in this hoard. This could indicate that ordering of the hoard was also based on the age and also perhaps the seniority of the artefact, with some of the oldest and/or most used objects deposited first.

We can imagine the sequence of events for Hoard L in the same way as for Hoards G and H, above. First, a pit was dug, larger than those required for the other hoards. Hoard L was one of the largest nested torc deposits, and there may also have been a desire to arrange the torcs openly in the ground, rather than having them in a tight stack as in Hoards G, H, K and J. In the stacked hoards, each torc when placed would have obscured the one below it at least partially, meaning that only one torc was ever fully visible. The alternative approach taken with Hoard L would have given viewers a spectacular visual impression of the torcs in the ground – an array of some of the finest examples from Snettisham, each one unique. Indeed, the image of the lower hoard *in situ* in the base of the pit (**Fig. 23.6**, bottom left) has become an iconic photograph, reproduced in almost every publication which mentions Snettisham.

Once the pit was dug, the torcs began to be placed into the ground. First was repaired torc L.21, its terminal reattached with a metal strip. Then came L.20, so broken it could probably no longer be worn, with its separated ends carefully overlapped to leave it looking almost complete again. Next was the heavily repaired, much worn 'Grotesque Torc', L.19. As Joy (2016, 247–50) has noted, these three were quite likely the oldest torcs in the lower pit. Torc L.19 is decorated in a style of art that was in vogue in the 2nd and 3rd centuries BC (see also Stead 2009, 329) meaning that (if Hoard L was deposited at the same time as the hoards dated by coinage to the mid-1st century BC, including B, C, E and F) it could have been more than a century old at the time of burial. In this case, it would have long outlived those who made and first wore it. Another nine gold alloy torcs (L.18–L.10) were then placed into the ground one by one, all but two of them (L.15 and L.16) complete. Whilst each torc was generally placed on top of the previous one, they were arranged so as not to obscure the others, especially the terminals. Gradually, the assemblage spread out to cover the entire base of the pit. Of the twelve torcs so far deposited, almost all were decorated: seven with Celtic art (a quarter of all objects at Snettisham with curvilinear art) and four with

Figure 23.6 The lower pit in Hoard L (photographs in reverse order of excavation sequence, to give an impression of the act of depositing the torcs)

simpler ornament (representing most of the multi-strand torcs from Snettisham decorated with non-curvilinear motifs, see Ch. 21). All the complete torcs in the lower pit have quite large internal circumferences (424–540mm), but it is difficult to know how much weight to give this, especially given that many have their terminals open quite wide, meaning they would not in any case have fitted closely around the neck.

There can be no doubt that this assemblage was special, and it has a very different flavour from the other nested hoards. Whilst assigning relative importance to objects is fraught with difficulty, in terms of their complexity, level of decoration, precious metal content and size, the group which form the main component of the Hoard L lower pit are all comparable to the two exceptional torcs which capped the lower stacks in Hoards G and H. Those assemblages each contained only one such torc, whereas Hoard L has 12. It is also notable that whereas overall only around 4% of items from the Snettisham hoards were decorated (Ch. 21), there was additional ornament on all but one of the first 12 items placed into Hoard L. The final two objects placed into the lower pit are slightly different. L.9 is a broken fragment comprising around half of a gilded copper alloy multi-strand torc, and L.8 a broken copper alloy multi-strand object large enough to have been worn at either the upper arm or the neck, depending on the individual. The resulting hoard (**Fig. 23.6** bottom middle) is so visually arresting that it is hard not to wonder if it was designed to be viewed by a larger audience before the pit was backfilled: seeing these objects nested in the ground would have been spectacular, probably a greater density of such incredible metalwork would almost never have been seen in any other context. Given the long lives some of these objects had, the meanings and associations they could have accumulated, the sight of them in the ground together would surely have made a strong impression on anyone who had seen them worn in life, whether by powerful individuals for whom the torc was a part of their identity, or by varied people as an insignia which denoted a time-and-place-specific role. Finally, these torcs were covered with soil, and would not be revealed again for over 2,000 years.

But the deposition of Hoard L was not yet complete. Either immediately afterwards, or perhaps some time later (there is no surviving evidence of a marker for the hoard, but one could have been placed temporarily), another, much smaller, pit was opened up in the top of the first. This upper part of Hoard L consisted of just six torcs, and much more closely resembles the upper pits in Hoards G and H, perhaps suggesting that these deposits date to the same event or period of activity at the site. The first torc placed was L.7, a very simple two-strand silver-coloured loop terminal torc (**Fig. 23.7** top left). Then came two buffer terminal copper alloy torcs with coiled neck-rings, one of them (L.6) repaired at the back where the wires had begun to fail from repeated opening and closing of the torc (**Fig. 23.7** top right). As Joy (2016) has noted, this repair suggests that this may be one of the older torcs in the deposit, perhaps mirroring the placing of older, heavily repaired torcs at the base of the lower Hoard L pit. Organic remains found on L.6 were radiocarbon dated by Garrow *et al.* (2009; **Table 5.2**) to the 4th to late 2nd centuries BC, supporting the idea that it could have been at least 50–100 years old at the time of deposition. Three simple silver-coloured loop terminal torcs followed (L.4–L.2) (**Fig. 23.7** bottom row). The final torc, L.1, is interesting. It is more complicated than any of the other torcs in the upper pit, and the only one which is in any way decorated (albeit only with the suggestion of a fin motif in the negative space between arcs on its terminals, see **Fig. 23.8**, hence this piece is not discussed in Ch. 21). It is one of only five torcs (out of perhaps 500) from the site to have a Stage IV neck-ring (the most complicated multi-strand construction). The others are a fragmented reel terminal torc from Hoard F (F.119–20), the torc which capped the lower pit in Hoard H (H.7), a possible Stage IV fragment from Hoard B/C

Figure 23.7 The upper pit in Hoard L (photographs in reverse order of excavation sequence, to give an impression of the act of depositing the torcs)

(B/C.62) and the torc which began the deposition of Hoard L: L.21. Torcs L.21 and L.1 are far from identical (L.1 is slightly smaller, and its terminals simpler), but they do resemble one another (**Fig. 23.8**), and differ from the other torcs in the deposits. It is hard not to wonder if the closing object was chosen as a deliberate reference to the torc which began the hoard.

Overall, within the nested torc hoards at least three or four groups of deposits can be identified: the spectacular lower deposit of Hoard L is without parallel, though the bases of Hoards J and K (their upper layers heavily disturbed by ploughing) may be smaller, less ornate, more tightly stacked versions of similar assemblages. The lower pits of Hoard G and H are similar to one another, with simple, largely copper alloy objects towards the base and each capped with a single silvery/gold-coloured torc, between them representing a wide range of sizes. The upper deposits of Hoards G, H and L form the final group, each a tightly stacked set of silver-rich and copper alloy torcs, including coiled buffer terminal examples, and representing a narrower range of diameters.

None of these assemblages can be closely dated, and it is theoretically possible (as discussed in Chapter 22) that their deposition spanned over a century. However, the close interrelationship of their structures argues for a shorter timeframe. The similarities between the upper pits of G, H and L are such that it seems likely that their depositors were aware of one another, and were perhaps present for all three occasions. Likewise for the lower deposits of G and H, which are too similar for this to be mere coincidence. And if the capping of the upper pit of Hoard L with a torc which echoed the first placed in the lower pit was indeed intentional, then it suggests that those who made these upper deposits were closely aware of the earlier ones. Hoards J and K, severely truncated by ploughing, are hardest to tie into this picture, but are most similar, if anything, to the lower part of Hoard L.

It is also possible to suggest connections between the nested hoards and the fragmentary ones, though these are more circumstantial (and no joins have been found). Overall, as noted in Chapter 22, the range of material represented in almost all the torc hoards (B, C, D, E, F, G, H, J, K and L) is certainly similar, with only Hoard A being noticeably distinct. It was argued in Chapter 20 that the simple Z-twist torc from the base of Hoard G (G.14) may have been made by the same individual as the very similar groups from Hoards B and C. Machling and Williamson (2020) have called attention to the similarities between the wire strips used as repairs in Hoard L and similar fragments from Hoard F. They also note that the small droplet on torc fragment E.1b (passed through the terminals of the 'Great Torc') resembles the splashes of molten metal seen on pieces on Hoard F, perhaps suggesting that E.1b was drawn from the same pool or collection of material.

Figure 23.8 Torcs L.21 (left) and L.1 (right), the first and last torcs deposited in Hoard L, respectively

The spatial organisation of hoards across the site may also reflect some of these relationships. Hoards G, H, J and K are all in a tight cluster around 30m across, in an area which also contained B, C, D and E. G and H themselves, overall the most similar hoards, are only around 10m apart. The more unusual and, perhaps, most impressive hoards are spatially separated from the main group: Hoard L is approximately 40m to the south, just down the slope, while Hoard A (including the only complete tubular torcs from the site) and Hoard F (with by far the largest number of objects represented) lie slightly to the east (see **Fig. 1.3**).

The discovery of the field system (see Ch. 8) allows us to translate this spatial arrangement into an understanding of potential movement across the site. Entering the hoard field from the south-west (as suggested by the location of the entrance to the later enclosure ditch) would lead straight to what appears to be a narrow entrance way in the field system, opening out into an open area where Hoard F was buried, hundreds of fragments placed into the ground in an upturned helmet. Just to the right was a small square enclosure, approximately 20m by 20m. The exceptional Hoard L and coin-hoard N were each buried in one corner of this space. Turning instead to the left of the open area would take one to a larger enclosed space, perhaps a sanctuary of some kind. Hoard J and Hoard E were buried on either side of the entrance, while within were placed a cluster of hoards, including B, C, D, G, H and K. Hoard A is buried some 50m to the east, in another defined area.

These close connections between the torc hoards, in terms of both their contents and structure, suggest a relatively compressed timeframe for their deposition. Hoards B, C, E and F all contain coins with terminal dates around 80–60 BC (see Ch. 22, **Table 22.3**), and it seems most likely that the majority of the torc hoards at the site were buried around this time, in the mid-1st century BC. Some of these objects had long biographies, while others seem unfinished or only lightly worn (Ch. 20), but they were most likely taken out of circulation at around the same time. The only assemblage that cannot be closely tied into this series is Hoard A, also the most spatially separated, making it the strongest contender for an earlier or later deposit.

Why were the torcs buried?

The decisions leading up to the burial of the torc hoards at Snettisham are far harder to reconstruct than the depositional sequences. Were these objects still in regular use, perhaps worn by particular individuals, or representative of an office or other more fluid roles? Or had they been retired some time previously, and either displayed in a public place, or hidden away? If the latter, did this happen when their owner died, when a particular office or social role was no longer required, or when new ways of displaying power and authority had rendered them obsolete? Most of the torcs in the nested hoards were complete and could still have functioned as ornaments. But some of these, and the majority of torcs represented across the site, were fragments, or so broken they could no longer be worn. The fact that many fragments (both in Hoard F and elsewhere, e.g. E.1b and L.15) show evidence of melting suggests that this breaking up did not happen at the moment of deposition, but sometime previously, in another context. Had a decision been made to re-use or recycle parts of these objects, and to retain the remainder for later recycling, display, or planned future deposition? No joins have been found between hoards or composite groups. This suggests that the fragmentary objects were only partially represented in depositional acts at the site. The other sections of these objects must have been treated differently. Most likely they were eventually recycled; if they were deposited elsewhere, then none have been found.

In his paper exploring the possible processes of collecting the artefacts represented in the Snettisham hoards, Joy (2016, 248–9) speculated that perhaps individuals were encouraged to give up their torcs, or, once the wearer died, instead of being passed on to someone else they were collected for eventual deposition. This raises the intriguing question of where and how they were kept. Perhaps the torcs were displayed for a time prior to deposition, as he (Joy in Baldwin and Joy 2017, 116) has speculated in the case of a large deposit of Middle Iron Age cauldrons at Chiseldon. In his paper on the Snettisham hoards, Joy (2016, 249) referred to the Anglo-Saxon story of the Deeds of Hereward, who, as Gilchrist (2012, 18–19) outlined, met a Flanders girl called Turfrida who was responsible for treasured family

possessions. These included artefacts belonging to her mother, father, grandfather and great-grandfather, with Turfrida acting as a custodian of both the objects and the knowledge which accompanied them. This is of course a story originating from a different time and context, but it does highlight one mechanism by which objects and knowledge could be gathered. Other potential processes include the gathering of artefacts through gift exchange and alliances, as some Bronze Age deposits have been interpreted (Needham 2007, 280). We can also only guess how the torcs were carried to the site. Were the complete objects perhaps borne around the necks of their owners, or chosen individuals? What about the fragments? Were some hoarding events accompanied by a public procession, or were torcs carried to the site more discreetly, in a box or bag? Were the deposits public affairs, or quieter occasions?

We do not know precisely how the site at Snettisham was approached, but it was seemingly set apart from the nearest settlement, which lay across an inlet from the Wash, if not further afield (Ch. 3). When the site was unenclosed, as it most likely was when the torc hoards were buried, it could have been approached from any direction: across the water and upslope from the southern side of the site, or on foot on the way out towards the promontory at Ken Hill. As noted above, the enclosure system may have served to structure movement across the hoard field. Nestled at the foot of the hill, gently sloping down inland towards the inlet and settled landscape of field systems to the south and east (see **Fig. 3.7**), the site would likely have been visible to anyone watching from the landward side of the inlet. Looking out north and west, the 'gold field' would have lain at the edge of the water on the right, with the long narrow promontory of Ken Hill rising up to the left, pointing towards the Wash and the mouth of the inlet. When the site was enclosed, the southern side of the field was left open, sloping down towards marshy ground and the water. The main entrance entrance to the later Romano-British polygonal enclosure was put on the far western side of the hoards, opening out onto the upward slope of Ken Hill, rather than on the inland side that might have connected more directly with settled areas to the south and east. This suggests that perhaps the journey to and from the site did not take the most direct route, but may have included other areas and paths, perhaps continuing out along the promontory. Nevertheless, despite the clear importance of the coastal topography of the site, depositional activity appears closely focused in the delimited, enclosed area of the hoard field rather than at the wetland margins around Ken Hill. The digging of the enclosure ditch, probably sometime in the 2nd century AD, hints at a broader theatre of ritual or religious performance, perhaps formalising existing paths, spaces, and practices evidenced through the field system discussed above and in Chapter 8.

The precise nature of the rituals and performance around the deposition of the hoards will never be recovered, but a crucial question which we have more hope of answering is, 'Why were the torcs not all recycled?'. Metal is readily transformed into new forms, and the broken and part-melted appearance of many of the objects (especially from Hoards B, C and F) strongly suggests that some torcs, or at least fragments, were indeed melted down. So why not all of them? As already discussed above, torcs are intimately associated with the human body. It is likely that connections with, or memories of, the people who had worn them were maintained at the time of deposition. Andrew Jones has highlighted how objects can act as 'physical traces' of events in the past, their persistence over time acting to call up past events, evoking the senses (Jones 2007, 19–25). Memories are not fixed and do not create themselves. They are created and recreated, narrated and re-narrated (Meskell and Joyce 2003, 160). Objects act as anchors. Memories can be maintained and created through the persistence of objects across generations, as well as by reading physical signs of damage and age (Jones 2007, 57). Rosemary Joyce (2000, 13) highlighted the tradition across much of Mesoamerica, in Indonesia, Oceania and the north-west coast of North America of incorporating 'heirloom objects' into costumes, particularly those intended for younger members of social groups. These were passed through generations along with knowledge of their histories. Some of the long-lived torcs may have acted in this way. Heirloom has also been used to describe prehistoric objects thought to have been curated for multiple generations of the same family (Lillios 1999), some of which might have been linked to named individuals and had known histories and genealogies (cf. Hinton 2005). These associations may not have been exclusive to families as is implied by describing torcs as heirlooms. Whitley (2013, 406) noted a group of artefacts from the Mediterranean Bronze Age retained in circulation for many years because they embodied and sustained important relations between people across a wide geographical expanse. Discussing the role of Roman material culture in the Augustan period, Haug (2001) also drew a useful distinction between what she referred to as the recent and distant pasts. The recent past is restricted to the experiences of still living people, spanning three to four generations (*ibid.*, 112). The distant past on the other hand can only be accessed through collective memory and is semi-fictive or mythical (*ibid.*, 113). Caple (2010, 315) labelled artefacts related to the distant past as venerable objects which, according to him, are valued for their great age and links to or associations with a mythical past. It is possible that many of the torcs deposited in Hoard L were regarded as heirlooms, or Whitley's somewhat broader group; some may even have fitted into Caple's venerable object category. As already highlighted, there is a distinct generational element to the deposit (Joy 2016, 249). The individual torcs could represent the people depositing the hoard, or perhaps the generation immediately preceding them and the older adults present. The radiocarbon dated torc L.6, probably at least around 50 years old at deposition, could represent two to three generations past, and the 'Grotesque Torc', L.19, might have reached back four to five generations or more. Depending on the preservation of knowledge, the individuals who wore these torcs and the events they were worn at could have been remembered in the form of a genealogy or history of ownership. The 'Grotesque Torc' was so old its origins and early history may have been largely forgotten and it could instead have been venerated for its great age.

The manufacture of torcs from an exotic material – precious metal, some or most of which was probably ultimately sourced from the continent – could have bestowed certain qualities on the objects, perhaps associated with an ancestral place or stories about people from far away (Helms 1988). Describing the 10th-century will of a woman named Wynflaed, Hinton (2005) explained how Wynflaed's grandson was bequeathed a gold cup so that he could add it to his arm-ring to make it bigger (Hinton 2005, 310). But as Caple (2010, 310) speculated, it is unclear whether in the grandson's mind the reformed arm-ring became associated with his grandmother or was valued simply because it was even larger. Nevertheless, the details of Wynflaed's will point to another mechanism by which material from a past object was incorporated into a new one and also how that newly formed artefact might be valued. This need not be restricted to manufacture. For example, the repairs to the 'Grotesque Torc' include fragmentary artefacts such as the gold sheet (probably a section of tubular torc) used to repair the back of the neck-ring, and the multi-strand torc or bracelet used as a clasp. They could have been selected at random from available material at any time up to the point of deposition, but equally, memories of the histories of these objects and the people to whom they related may have been preserved, with these objects deliberately chosen to bind together the different histories of multiple artefacts, people, or families.

One of the necessary processes of enacting change is to break down or alter the existing state of affairs. The first East Anglian torcs were probably made from gold alloys ultimately sourced from the continent – possibly in the form of coins, torcs, or other ornaments. In this case, the recycled artefacts were seemingly valued primarily as a usable material, albeit an exotic one. Certainly, the value placed on the origins and pasts of these objects was less than that placed on their properties as re-usable material. But, as we have argued, when it came to recycling torcs of the types seen at Snettisham (later most likely for making coins), this was not always the case. Perhaps the artefacts deposited in nested hoards were so intimately tied to their wearer(s), and/or the roles, events and performances of which they were a part, that they were deemed unsuitable for recycling. They may have become in Weiner's (1985; 1992) terms, inalienable: 'imbued with intrinsic and ineffable identities of their owners which are not easy to give away. Ideally, these inalienable possessions are kept by their owners from one generation to the next' (Weiner 1992, 6). They could even be viewed as a kind of absent body, disrupting the normal flow or transition of objects into new types (Needham 2001). Hoard E, which we have speculated might represent a discrete jewellery set (with matching torc and bracelet), could be cited as an example of what we mean by an absent body. As already mentioned, burials are rarely found in the region. This may be as a result of poor preservation or, more likely, burial practices leaving little archaeological trace. But we could also be missing a vital perspective in Iron Age practice, whereby deposited objects could also have stood for people. Just as bits of bodies appear in other contexts, particularly settlements, we may see a blurring of the boundaries between objects and people. The relationships and events of which these objects were a part, their histories, who owned and used them, where and when, were also interred, bringing lives and biographies to an end. Through the process of hoarding, these social facts were transformed into something different. Memories were no doubt preserved about the hoards and what was buried at Ken Hill, but the artefacts were removed from the living world. Perhaps, by consigning objects to a hoard they entered what Appadurai (1986) termed the 'ex-community state', whereby torcs became exclusive to the god, goddess, spirit, or place they were offered to, physically, conceptually and permanently removing them from the social sphere (Aarts 2005, 22). This could have created social space for coins as a new symbol of wealth, power and political allegiances (see below). Appadurai (1986, 21) also proposed the term 'tournaments of value': recurring events in which status and identity are redefined (Aarts 2005, 24). Hoarding provided a stage setting whereby artefacts were reformulated and given new significance, communicating specific concepts for the articulation and re-articulation of society (Arwill-Nordbladh 2002, 201; Jones 2007, 45). Some of this 'stage-managed' creation/communication/reinforcement of relationships, rules, or hierarchies is perhaps seen in the careful ordering of Hoards G and H.

Most of the torc hoards buried at Snettisham seem to have been deposited around or sometime before *c.* 60 BC. Certainly, there is no evidence from either radiocarbon dates or associated coinage that any of the torc hoards were deposited significantly later and, as argued above, most may well have been deposited over a relatively short frame of time. The site did remain in use, but the major later deposits were restricted to 1st-century AD coinage (Hoard P) or unformed lumps of metal (Hoard M). The mid-1st century BC seems to have been a time where, throughout Norfolk, torcs were being replaced by coins as key objects in social networks, particularly in as far as the use of precious metals was concerned. Could repeated deposition at Snettisham mark major social events which facilitated the transformation from a world of torcs to a world of coins (Gosden 2013; see below)?

The performance of wearing torcs must have been a significant aspect of life in north-west Norfolk before the mid-1st century BC. Therefore, in order for a world of torcs to be replaced by a world of coins, torcs had to be taken out of circulation. Gathering them together and placing them in the ground at an important site, possibly as an offering, was a socially acceptable means of removing these objects from the living world of Iron Age communities. Repeated depositions at Snettisham performed this social change, reinforcing and sometimes subtly manipulating exactly what was being communicated.

The processes of fragmentation and accumulation represented by the two types of hoard (nested, fragmentary) worked in tandem. Sufficient artefacts had to be accumulated in order to emphasise the significance of the change. Fragmentation, melting and combining of selected artefacts represented the transformation of materials, and possibly the creation of new social and political ties, or the breaking down of others. Deposition of both types of hoard therefore enabled and enacted a shift in society. These activities and the relationships they embodied all coalesced

at Snettisham, an important location in the landscape. If we view the hoards as collections, we can imagine these collections as a way of being (Moutu 2007, 108). By this we mean, as Moutu (2007) stated, collections, through the interaction of people and things, bring about '…a combined effect that is greater than individual persons or things could effect on their own accord' (*ibid.*, 108).

Treasure, or a related set of deposits?

In his survey of Iron Age hoards, Haselgrove (2015, 27) drew a distinction between closed groups of objects deposited in a single act (hoards) and other collections of artefacts which have accumulated over a period of time or have subsequently become associated through good fortune. Examples of this might include the material found at Hallaton, Leicestershire, where the artefacts appear to have resulted from a series of related but distinct episodes of activity (Score 2011). As an example of association through good fortune, many of the Celtic art objects now on public display at the British Museum were found during dredging of the Thames, most likely becoming an assemblage through the vagaries of tides and currents, and location of bridge building and dredging on the river, rather than the ancient activities which led to their deposition.

In terms of the Snettisham hoards, as already outlined, Stead (1991a) suggested the artefacts should be interpreted as a single treasure, although he acknowledged the complexity of the division into separate groups, writing, 'although the hoards could have been contemporary with one another, it was not a matter of one huge treasure being divided into a series of equal instalments. Hoards B/C and F, with coins and scrap metal, are quite different from the "nests" of torques, and the only complete tubular torques were set apart from the others, in Hoard A' (*ibid.*, 455). Most of the hoards were discrete deposits. Some (Hoards G, H, L) had at least two phases or levels, but these seem to reference one another and seem unlikely to have taken place over anything other than a fairly short period of time. If they were separated by a longer interval, there must have been an attempt to mark the location of the original pits (albeit temporarily, since no markers now survive), and keep alive the memories of the earlier deposits. None of the hoards containing only torcs can be closely dated, since there is evidence that objects sometimes circulated for a long time, and in the absence of additional material for radiocarbon dating or more closely datable associated objects, it is difficult to narrow down the timeframe. Nonetheless, the range of objects contained in the torc-only hoards map closely onto those found in hoards such as E and F which can also be dated through associated coinage, suggesting a date before *c.* 60 BC for their deposition (see above and Ch. 22). Unfortunately, we cannot establish the period of time that elapsed between each deposit, so they may all have taken place within a few days, a number of years, or even over decades. Either way, on Haselgrove's terms, these are discrete hoards or collections that have accumulated in the same location over a period of time. They are a series of separate but related deposits, buried at Snettisham sometime between the late 2nd century and *c.* 60 BC, with the site being chosen because it was simply a special place and/or because its location on a coastal promontory reaching out into the Wash was significant (**Fig. 3.1**). Each of these hoards share similarities but are sufficiently different to indicate assorted collection histories. Perhaps individual hoards served related but subtly different purposes. For example, the wide variety of bronze and silver-coloured torcs deposited in a very specific order in stacked Hoards G and H suggests a different type of event to the more visually similar (though each unique) gold alloy torcs laid out in the base of Hoard L. Each new deposit would have referenced those made previously and possibly looked to future hoards: this was not a static process, but rather one of transformation. While hoard deposition was probably not an everyday experience, as Farley (2012) noted, '…in periods of dramatic social change it [hoarding] appears to have become a field of discourse through which political allegiances and new systems of value were negotiated and reinforced' (*ibid.*, 46–7).

Hoards M and P, which were deposited up to a century later, fall more easily into Haselgrove's second category: objects which have subsequently become associated. It is unlikely that they directly followed the practices that took place in the 2nd to 1st centuries BC, but knowledge of these earlier hoards as well as of the significance of the site must have contributed to the decision to deposit material at Snettisham again. Indeed, the evidence from coinage (including a possible scattered hoard of Norfolk Wolf B staters, dating to the late 1st century BC, see Ch. 15) supports the idea that the 'gold field' at Ken Hill may have remained in use over subsequent generations as a place for more infrequent acts of deposition, in line with wider phases of intensive deposition across Norfolk (Talbot 2017, 110). This continued usage was very probably the main motivation behind digging an enclosure ditch around the site and possibly building a temple there sometime after AD 100 (see Ch. 9). As with Hoards M and P, the site's importance and the motivations behind the activities there are likely to have shifted over time.

On transformation: from 'torc world' to 'coin world'

> From as early as the third century BC, torcs are joined by coins of gold (and later silver), with which they seem to have a close relationship (Gosden 2013, 47).

The purpose of this section is to consider the social processes leading to the deposition of the Snettisham hoards, particularly the burial of hundreds of torcs, an artefact type otherwise rarely represented by more than half a dozen examples in any single deposit (see Ch. 22 and Gazetteer). In particular, we argue that the decision to bury such an unprecedentedly large number of torcs at Snettisham was closely entangled with the shift from a 'world of torcs', where bodily ornament, predominantly of precious metal and bronze neck-rings, was a central element of creating, signalling and embodying social roles and structures, to a 'world of coins' where precious metals were deployed in a very different manner.

Before exploring this further, it is necessary to very briefly outline the chronology of coinage in Late Iron Age Britain, and specifically in East Anglia, in which we follow the

excellent discussion by Talbot (2017). The chronology of Iron Age coinage is also covered in Chapter 15, where coins from the site are discussed in detail. Coinage first appears in southern Britain in the mid- to late 2nd century BC. Types circulating at this time include imported Gallo-Belgic A and B gold, probably originating from the area of present-day north-eastern France and Belgium (though Sills (2017) has argued that some were made in Britain). The earliest British coin production, cast bronze potins made in the south-east, began in the late 2nd century BC. Gallo-Belgic C issues appear in southern Britain by the early 1st century BC, and the period *c.* 80–60 BC sees the production of the first insular gold issues in the south (British A, B, C, D, F, G), as well as the continued production of potin coinage. Gallo-Belgic E coinage appears in Britain from *c.* 60–50 BC, with its main phase of manufacture conventionally being associated with the Gallic Wars.

At first, coins must have been quite scarce. Exactly how coins came to Britain is unclear, but it is unlikely to have been via a single process or to serve just one particular role. Perhaps they arrived as the result of cross-Channel trade, gift exchange or were even payments to mercenaries (Leins 2012). Their presence likely emerged through long-established contacts and relationships with people living on the continent (*ibid.*). Whatever the exact mechanisms, they were rapidly incorporated into local contexts.

Early gold coinage is rare in East Anglia. The first type to have been found in any quantity is Gallo-Belgic E. Potins are also found in the region, though, as Talbot (2017, 141) has argued, 'little is known about the use of this early coinage, and whilst it adds to the general picture of familiarity with coinage, it has little in common with Icenian coinage and seems unlikely to have been a major factor in the commencement of local production'. The first coinage issued specifically for the region was most likely the Ingoldisthorpe stater and quarter stater, which were probably minted in the North Thames area around 58–55 BC (*ibid.*, 11–13, 141). Local production of coinage begins in East Anglia in around 55 BC (*ibid.*, 8, 13–18), when the Ingoldisthorpe coinage was superseded by the earliest East Anglian gold issues, Norfolk Wolf A staters and quarter staters, which Talbot argued began to be produced during or shortly after the Gallic War, and were most likely predominantly made in a single location (*ibid.*, 14–15). This was followed shortly after by Norfolk Wolf B gold staters, a complicated and long-lived coinage which Talbot argued was produced across at least three locations (*ibid.*, 15–18). Production of the first local East Anglian silver coinage (Bury A, Bury C and Bury H types) may have begun within a few years of the gold coin production (*ibid.*, 19). Talbot (*ibid.*, 141) described the first 40 or so years of East Anglian coin production as the 'early local period', spanning *c.* 55–15 BC. Coins from this period have stylistic imagery including wolves, horses and heavily abstracted faces (see below). Talbot noted that at this time coinage was 'generally more local than in later periods… [with different types] not uniform in their production and distribution characteristics; different coinages were produced in parallel' (*ibid.*, 141).

The metal sources for these early local coinages have been much debated. Talbot (2017, 15, 73) speculated that the first local gold coins, Norfolk Wolf A, were produced using metal from recycled Gallo-Belgic E coins. But the metal composition does not match exactly, with varied proportions of gold, silver and copper among the coins tested by Talbot (40–55% gold, 35–44% silver, the rest being copper), and a slightly higher proportion of tin than seen in Gallo-Belgic E (*ibid.*, 72–4, table 4.16). The Norfolk Wolf B staters tested by Talbot are substantially more debased and varied in their compositions (14–31% gold, 28–46% silver, and most of the rest copper). We argue that the discrepancies highlighted by Talbot could possibly be accounted for by the use of additional metal from recycled torcs. The earliest local gold coinage was therefore probably made from recycled Gallo-Belgic E coins *and* melted down torcs. This cannot be ascertained with certainty, especially since torcs comprise such varied alloys (see Chs 17 and 18), and the degree of sorting and processing of the material would have strongly affected the result. But while it is unlikely, based on composition, that torcs were melted down non-selectively en masse as the primary component of alloys intended for coinage, some inclusion of torc fragments would explain the varied and debased gold alloys seen especially in Norfolk Wolf B types. However, torcs (or at least precious metal examples) probably did not form a major component of East Anglian *silver* coinage, since the bullion content of early silver issues is generally extremely high (Dennis 2005; Talbot 2017, 74–7, table 4.17), and they appear to have been made from imported Roman silver bullion debased with small amounts of copper alloy (Dennis 2005, 2.2). The small amounts of gold present in early East Anglian silver coinage (*c.* 0.45%) can be accounted for in the naturally occurring levels of gold in silver bullion (Talbot 2017, 75).

The end of this 'early local period' of coinage production in East Anglia (*c.* 20–10 BC) was a time of major change. The Norfolk Wolf B coin series had become increasingly debased, and the end of the period sees the largest incidence of Icenian gold coin hoarding (Talbot 2017, 142). A possible scattered coin hoard of Norfolk Wolf B staters at Snettisham may date to this time (*ibid.*, 110, and see Ch. 15). After *c.* 15 BC came a period of more organised and restricted production of gold and silver 'denominational' coinage in East Anglia, based at two to three mint sites. Inscribed coinage began *c.* AD 25. The next major peak in coin evidence comes at the end of the main period of local production, during the Boudican revolt, *c.* AD 60/61. Hoard P at Snettisham can be linked to this horizon.

Torcs at Snettisham have been found in association with early potins (Hoard C), Gallo-Belgic A and C staters and quarter staters (Hoards B, C and F) as well as very early insular issues minted in southern Britain (British Cf gold quarter staters) (Hoards B, E). Most of these coins were most likely produced before *c.* 60 BC.

All of these types are rare finds in Norfolk, imported from the continent or southern Britain, and pre-date or coincide closely with the first local coin production in East Anglia. The absence of Gallo-Belgic D and E or any subsequent coin issues from closed deposits supports the hypothesis that the torc hoards at Snettisham all most likely pre-date *c.* 60 BC. We have argued for a relatively short chronology of deposition at around this time. After *c.* 55 BC, the majority

of precious metal objects circulating in Iron Age Norfolk were probably locally produced gold and silver coins rather than torcs. The burial of the Snettisham hoards therefore coincides with a period of major transformation: the transition from a 'world of torcs' to a 'world of coins'. This is important in a number of respects, not least that the Snettisham hoards were not solely about closure, a socially acceptable means of disposing of objects: they were also transformative, enabling a major social shift. But what is it about coins (and torcs) that might have driven these changes? What can coins do that torcs cannot? Also, thinking from the opposite direction, what do torcs do that may no longer have been desirable?

One factor which makes this question difficult to answer is that, owing to the intellectual traditions which separate the study of coins from other types of artefact, coins have not always been studied in the same way as other types of archaeological object (Kemmers and Myrberg 2011, 88). As is exemplified by discussions of coins so far in this monograph, certain qualities of coins are useful to archaeologists, such as their helpfulness for dating (Lockyear 2012, 191). These aspects often form the focus of discussion, whereas the potential qualities of coinage in social interaction are often ignored (Creighton 2000 and 2006, Leins 2012 and Talbot 2017 are notable exceptions). Owing to the fact they are in use today, coins are also often interpreted from our Western capitalist understanding of what coins are and do. Yet, as is exemplified by their inclusion in votive hoards, coins have many other characteristics rather than as tokens of value, stores of wealth, or chronological markers. Unlike other Iron Age artefacts, many later examples also combine image and text with their material form (Kemmers and Myrberg 2011, 89). Coins are small and portable. They can travel through multiple hands, carrying messages and forming diverse relationships across space and time. Similar to torcs, colour was also an important aspect of Late Iron Age coinage, first with clear attempts to maintain a consistent yellow-gold colour, and later (after a transitional period *c.* 50–20 BC) a preference, or necessity, for redder hues (Creighton 2000; Farley 2012; La Niece *et al.* 2018). Many accounts of coins also rely on it being issued by a 'competent authority'. But as Haselgrove (1987, 22) stated: '…a "competent authority" could be *any* individual with the necessary resources and technical skills'.

Just as individual coins can have their own lifecycles, so too can we chart a general lifecycle of coin use during the Norfolk Iron Age. Initially, coins and other precious metal objects came from southern Britain or the continent and many were probably melted down to make local-style torcs, production of which seems to have begun, at the latest, in the 3rd century BC. Indeed, one Gallo-Belgic A coin (no. 174, found in Hoard F in a 'package' formed from broken tubular torc fragment F.53) had been cut in half, and a stater in Hoard B (no. 11) had been hammered out, suggesting a willingness to break up and rework these imported objects. In the initial phase of torc making, continental items used as a source of material could be described as 'scrap', but as discussed above, they probably also carried other associations linked to their distant origins and their role as gifts and items of exchange. Drawing on the idea of 'informed' material discussed in Chapter 22, these associations could have been preserved in the new artefacts. Gold alloys could have been originally preferred as the raw material for torcs because of their exotic origins (cf. Helms 1988), one of the inherent qualities, alongside shininess and colour, that dictated the symbolic importance of both gold and the objects it was used to create. Later, it became established and 'traditional' for torcs to be made from precious metals.

As argued above, it is likely that in north-west Norfolk many torcs which were not deposited in the mid-1st century BC were melted down to make coins. Here we can see the 'cycle of materials' exemplified by Needham (2007), but also a transformation of roles from coins → torcs, to torcs → coins. It is also possible to interpret this link between torcs and coins as a form of 'biographical entanglement' (Rainbird 1999; Joy 2002), whereby aspects of the biographies of one item could have been maintained in another of a different material form. If this were the case, it could imply a level of maintenance and stability in contrast to the abrupt change from coins → torcs → coins that we see in the archaeological record.

Looking more broadly, it is interesting to note that, on the continent, mixed hoards of torcs and coins are found from the 3rd century BC onwards (Fitzpatrick 2005), although torcs were in circulation long before the appearance of coins (Aarts 2005, 23; Hautenauve 2005). Indeed, by the mid-1st century BC, when torcs were seemingly most widespread in Britain, torcs, neck-rings and collars no longer appear in such frequency in graves on the continent as they had done in previous generations (cf. Stead *et al.* 2006), but rather in hoards (Fitzpatrick 2005). The combining of coins and torcs in hoards on the continent over such a long period of time suggests that here there was no dramatic shift from a 'world of torcs' to a 'world of coins' but a longer and more gradual change, with the two forms of precious metal object co-existing for many decades or even centuries. For example, the Frasnes-lez-Buissenal torc and coin hoard from Belgium contains Gallo-Belgic E and other contemporary coin issues from the mid-1st century BC (Hautenauve 2005, 194–5), but is located in the heart of the distribution of earlier Gallo-Belgic A and B issues, suggesting that, in this region at least, coins and torcs had co-existed for at least 75 years (Fitzpatrick pers. comm.). In East Anglia, the shift is much sharper.

The decision to strike coins locally in Britain, rather than just to utilise and adapt imports into local contexts, was an important one. Not only did it increase the frequency of coins, resulting in them being more widely available, but as Ian Leins has expressed, 'the decision to strike coins also reveals a fundamental change in function, reflecting the transition from coinage as a passively absorbed object to a desirable or *necessary* [original emphasis] object within local society' (Leins 2012, 291). This suggests that coinage and, perhaps more importantly, the authority to mint an issue of coins, had become important in local politics and society.

The uses of money have been much debated in archaeological and anthropological discourse (e.g. Bohannan 1959; Bloch and Parry 1989; Maurer 2006).

Money is often seen to inspire radical social change (Bloch and Parry 1989, 3), such as a shift from a gift-based to a commodity-based economy, and this idea has been influential in some discussions about the Iron Age. From a Western capitalist perspective, it is hard to argue with this statement. The adoption of coinage is seemingly an inevitable step towards capitalism. But this reasoning is teleological. As we have seen, it is not at all clear that the initial usage of coinage in Britain was regarded as anything other than the adoption of another kind of valuable. Ethnographic examples show money means many different things, even in different contexts within the same society (Bloch and Parry 1989, 22). For example, it is not obvious that the introduction of coins always simplifies transactions (Haselgrove 1987). Often when coinage is newly adopted it is absorbed into a specific social context creating new relations that can be just as complicated as the ones they replace (Maurer 2006, 21). In an Iron Age context, it often seems that the predominance of coins is predestined: once a society adopts coins, their unique qualities will inevitably result in a monetary economy. As was discussed in detail above, in terms of gold coins (and torcs), another complication is the value we place on gold today. Gold is so obviously precious to us, it seems only logical that people in the past ascribed it similar value.

In an account of the potential uses of coins in the British Iron Age, Ian Leins (2012) argued British Iron Age numismatics has undergone a series of 'stages' of interpretation. Early studies such as the early work of Allen (1960), Mack's *The Coinage of Ancient Britain* (1953), but also later work by Van Arsdell (1989), were undertaken from a 'modernist' perspective, viewing the primary function of coins as fulfilling a function as a unit of account, a medium of exchange and a store of value (Leins 2012, 27). Haselgrove (1987, 17) termed this the 'formalist approach'. Dominant throughout much European Iron Age scholarship, gold coins are viewed as representing the 'natural' first stage in the development of a full commercial economy where goods and services can be bought and sold freely through monetary exchange. Largely following Polanyi's (1944) treatise on reciprocity and redistribution, whereby coins were seen as a means of payment for gift exchange, tributes, fines, compensations, ritual offerings and bride wealth, later 'substantavist' approaches allowed for the fact that coins could take on socially specific purposes or functions (Leins 2012, 27). For example, through examining the different contexts in which coins made from different metals were found, Haselgrove (1987) concluded that gold, silver and bronze coinage did not necessarily denote different denominations of value, but rather each coin type served a different function. A further critique of the modern or formalist approach was forwarded by structural Marxists who insisted on the historical specificity of different modes of production, but worked always in relation to capitalism (Haselgrove 1987, 18). More recently, 'cultural-economic' approaches to coinage have viewed the meaning of money as culturally specific (Leins 2012, 28). For example, Haselgrove and Wigg-Wolf (2005) have stressed the role of coinage in Iron Age ritual practices. But as Leins (2012, 29) argued, ritual functions are often inferred from the final archaeological context of the artefacts, often when coins were deposited as hoards. Coins may have served a number of different purposes throughout their lifecycles. Leins also stressed how function can be 'dynamic', as coins were adopted in new regions and by different parts of society (Leins 2012, 290).

Examining the denominations and distribution of early gold coins, Leins (2012, 294) concluded that they were 'stores of value' and were incorporated, with other artefacts of worth such as torcs, into existing social networks. This is supported by the widely distributed group of largely continental torc/coin hoards hoards considered by Fitzpatrick (2005), spanning the 3rd to 1st centuries BC. At some point, coins took on other significances beyond traditional social networks. Talbot's (2017) four phases of East Anglian coinage takes account of this, with his initial phase of early local coinage which was later replaced by denominational forms. The latter display more features associated with money (such as linked denominations, standardised weights, centralised control of minting, and stable imagery), and Talbot argued that 'over the hundred years or so of coin production, Icenian society became increasingly monetised' (Talbot 2017, 145).

When considering trade and exchange, particularly between Britain and the continent, much of the discourse has concentrated on what items were given in exchange for imports. These ideas, as Fitzpatrick (1985; 1993) has demonstrated through his analysis of imported wine amphorae, are based on our own concepts of the forms trade and exchange should take. As a result, much has been made, for example, of the quote from Strabo that the ancient Britons traded cereals, slaves and war dogs in exchange for wine – handily these were commodities leaving little archaeological trace, which explains why so few exports from Britain are found in Europe (Joy 2015). An alternative viewpoint could be that items such as gold staters were exchanged to help maintain long-distance relationships, and that these social and, perhaps, kinship networks were more important than maintaining a 'balance of trade' (Webley 2015, 130; Fitzpatrick 2001). Therefore, not only did the people of East Anglia gain from the availability of a new 'exotic' material, but the continental issuers of the coins, through exchange over the sea, extended their sphere of influence (Leins 2012, 295). If one subscribes to the presence of something like Gell's (1998) notion of distributed agency, in the eyes of the issuer, something of their 'selves' was also transported across the sea. Following this line of thinking, the 'exchange' may not be as asymmetric as it first appears and there is no need for items always to travel in the opposite direction.

Turning to the question of 'Why coins and not torcs?', one interpretation we could adopt for the demise of torcs would be to follow Simmel's (1957 [1904]) theory of fashion as emulation, where styles start at the top of a social hierarchy and are gradually adopted by the classes below until they are abandoned by the elite (presumably because their role as symbols of authority had been undermined or something else has developed to take their place) once they are taken up by the lower classes. This theory has been applied to Late Iron Age cremation burials accompanied by Roman

imports which began on the continent and were soon copied in Britain (Stead and Rigby 1989). One could therefore view the switch from torcs to coins from this perspective, but the theory of fashion as emulation has been criticised as being too mechanistic and simplistic (Entwistle 2000, 62–3). In this case it also does not explain the seemingly rapid transition from torcs to coins, at least in East Anglia (on the continent, the two forms of value seem to have co-existed for much longer).

Creighton (2000, 31) suggested torcs acted as insignias of kingship, while because of their portability, coins were a transferable system of the authority of kings. But this interpretation does not take adequate account of the active role of material culture in relations. What possibilities did coins create that torcs could not? Or what did torcs do that was no longer desirable around the mid-1st century BC? Focusing on the early local phase of coin production, something about coins afforded new kinds of relationship not previously possible and/or necessary. Here we see the adoption of coinage not necessarily as a revolutionary driver of change, but rather, the acceptance of a novel form of material culture initially assimilated into pre-existing social relationships. This was not predestined. Over time, the function and significance of coinage adapted and changed with Iron Age societies drawing on the affordances of coins, facilitating and enabling social change from within.

Talbot (2017, ch. 5) viewed the early local phase of coinage in East Anglia not as the death of a local art form with the demise of torcs, but rather as 'a massive burst of creativity' (*ibid.*, 85). In one of the best analyses of images on Iron Age coins, Talbot underlines the properties of these early local coins as examples of art, containing hidden images which require close scrutiny to uncover such as hidden faces, or certain qualities of images that can only be viewed from certain angles (**Fig. 23.9**). These images are just as rich and complex as those examined in Chapter 21 on torcs. Coins in this sense are therefore not so very different from torcs, but with the advantage that images were more easily reproducible. Just as torcs are unique artefacts, the nature of the dies used to strike early coinage which were 150–200% bigger than the surface area of the coin, also means that no two coins were exactly identical. Coin imagery did, however, tend to be more representative than the Celtic art on torcs. Whilst only a small proportion of torcs have recognisable faces in their decoration (Ch. 21), most early East Anglian gold coins clearly depicted stylised wolves on the reverse, and some silver coinage showed more naturalistic human faces and horses, alongside more stylised 'hidden face' imagery (Talbot 2017, 86–96).

The material forms of coins and torcs are clearly different. A torc is a form of visible wealth worn on the body. Experiences of torcs are shared with everyone who encounters the torc/person. Coins on the other hand are small and portable. Close scrutiny is encouraged by their small size and is restricted to the individual scrutineer. But experience of coins can be shared by others who also possess similar coins. Perhaps there was no longer a social need to display wealth on the body (Csordas 1994, 2); wealth may have been displayed through other means such as wearing gold and silver brooches, or possibly coins just proved more flexible in terms of their potential roles in relations. In particular, their qualities of reproducibility and transferability, as well as their ability to act as 'distributed persons' and carry messages through images may have made them irresistible.

Figure 23.9 A Bury F type early East Anglian silver coin, showing how the face depicted in two dimensions (left) takes on a three-dimensional aspect when viewed from an angle. Ashmolean Museum, Oxford, HCR121002. Accepted under the Cultural Gifts Scheme by HM Government from John Talbot and allocated to the Ashmolean, 2021. Image © Ashmolean Museum, University of Oxford

The issuing of coins demonstrated control over and access to a number of different factors: raw materials, knowledge, labour and resources (Farley 2012, 184–92; Farley 2021). These could be brought together and deployed to create a physical manifestation of authority, a batch of coins, which could then be distributed as a symbol of social and political ties and allegiances. A key element in the production of an issue of coins is the idea of standardisation; the value of coins is tied up with their multiplicity and reproducibility. One coin may not precisely resemble another, but two coins of the same type should, broadly speaking, be interchangeable. With torcs, the opposite aspect – variety and uniqueness – seems to be emphasised, both in terms of the sheer range of neck-ring and terminal forms and combinations, and the way that disparate objects are brought together in hoards and interlinked groups. This probably meant that individual torcs were highly recognisable and, perhaps, personal objects. The concepts of informed material (Bensaude-Vincent and Stengers 1996) and biographical entanglement (Rainbird 1999; Joy 2002) discussed above suggest that, when one item is recycled into another, aspects of the biographies and associations of the original artefact may be extended to the new material form. It may be that some torcs held such potent histories and identities that it was not considered appropriate to subsume them into the world of coinage.

Burying torcs at Snettisham and other sites did not necessarily represent an ending, but, rather, was an act of transformation. Instead of destroying these objects, they were deployed in another social sphere, that of deposition. An object which had perhaps become problematic through association with an older form of social authority could be converted into a new form of potential. The collection, fragmentation, recombination and deposition of torcs were carefully structured acts, most likely performances designed to challenge or reinforce social structures such as hierarchical relationships or kinship ties. We argue that taking these potent older objects out of circulation in a socially sanctioned

way also created space for a new kind of object, local coinage, and with it, new ways of negotiating power and authority. In these terms, the non-local Gallo-Belgic A–C coins and potins imported into Norfolk may have occupied a kind of intermediate position in a shifting social world, paving the way for the first locally produced coinage.

Conclusions: a site of transformation

Although the precise meanings of the Snettisham hoards are probably now lost to us, it is likely that the site had a deep and long-standing significance and that at least one aspect of deposition concerned making an offering of some kind. But, as is relevant more widely in terms of the interpretation of prehistoric hoards, these deposits are not just about ending or closing some event or ceremony: they were also transformational.

Ken Hill is conspicuous in the landscape and was an important place to which people kept returning. Its social and symbolic significance altered over time, but in many instances with reference to past human activities. Its aspect, a prominent hill overlooking the Wash and located near the fen edge, was probably a powerful factor in it being deemed an appropriate place for Neolithic settlement, and for the deposition of hoards (Lawson 2018) and perhaps feasting or other midden-generating activities in the Late Bronze Age to Earlier Iron Age (Chs 6–8; cf. Yates and Bradley 2010a; 2010b). Indeed, its conspicuous topographic position almost certainly contributed to its importance in the later Iron Age, as perhaps did social memories of past events and their significance. Perhaps some of the older torcs buried at the site had once been worn at feasts that took place there centuries before they were finally deposited. Whatever attracted people there, the activities carried out at Ken Hill in the later Iron Age were on a much larger scale than those from the Neolithic and Bronze Age. Over a period (whether decades or a very short timeframe) preceding *c.* 60 BC, unprecedented quantities of precious metal artefacts were buried in a series of separate deposits.

How such places are viewed can vary over time. In some instances, they were places of value and attraction. At other times, they may have been places to avoid or fear (Caple 2010, 307). For whatever reason, there was then most likely a brief hiatus in depositional activities at Ken Hill until a second, smaller series of deposits were made. The earliest that can be suggested is a possible small scattered hoard of Norfolk Wolf B coins dating to the late 1st century BC (Talbot 2017, 110; Ch. 15). In the 1st century AD, two hoards were buried: one of large part-melted silver alloy lumps (Hoard M), and a revolt-period coin hoard consisting primarily of local silver issues (Hoard P). The hiatus may be more illusory than real, or at least reflect wider social shifts rather than changing site use exclusive to Snettisham. Talbot (2017, 110) has suggested that coinage evidence at Ken Hill from the later 1st century BC and 1st century AD fits in well with wider periods of intense depositional activity across Norfolk, suggesting that Snettisham was never abandoned, but perhaps ceased to be such an exceptional site. Finally, sometime after AD 100, an area of the hilltop covering around 8 hectares was demarcated by a large polygonal enclosure ditch. Perhaps this marked the sacred space surrounding a Roman temple (Hutcheson 2011). It may also have been an attempt to keep people out, or even a means of containing whatever was thought to be present on the hill. Even in the early 20th century, local folklore warned children to beware the woods on the hill (NHER 1437).

As we have seen, dating evidence for the Snettisham hoards supports the hypothesis that the torc hoards were deposited within a relatively short space of time. The widest possible date range is from the 4th to 1st centuries BC, though we favour a much tighter chronology, focused just before or around 60 BC. A lack of chronological precision means it is impossible to determine for certain if they represent a short period of intense hoarding, or if the hoards were spread out over a period of 50 years or so, with deposits occurring on average every five years. Either is possible, but the likely period of time and effort required to collect the material, particularly for larger hoards, might imply individual deposits were separated by at least a few years (Joy 2016).

Chapter 24
Summary and Conclusions

Julia Farley and Jody Joy

The site

The 'gold field', near the village of Snettisham in Norfolk, has a long history both in terms of its ancient use and the 70-year span of archaeological discoveries, beginning in 1948. The site is situated on the lower slopes of Ken Hill, a prominent feature along the north-west Norfolk coast. Looked at on a map, this long, thin promontory resembles a finger pointing down from north to south, with its highest point at the southern 'fingertip' (up to 42m OD) and the hoard field nestled on the sheltered lower slope towards the base of the 'finger' (around 35m OD). Although very close to the coast, the site itself is on the inland side of the hill, overlooking the Ingol valley and the contemporary village of Snettisham.

Currently located slightly inland, during the Late Iron Age Ken Hill would have stood as a headland reaching out into the Wash. The hill was surrounded by saltmarsh leading down to open water on three sides and was probably accessible by boat at high tide. The southern, unenclosed, side of the hoard field sloped down towards an inlet from the Wash.

History of discoveries and investigations

The finds from Snettisham were recovered in a series of three main interventions. Early discoveries were made during ploughing in the 1940s–60s, followed by excavations led by Clarke (1954). These included torc hoards A (with its complete tubular torcs), B, C, D and E (the latter includes the so-called 'Great Torc').

Metal-detecting at the site in 1989–90 led to the discovery of Hoard F, and the subsequent British Museum excavations in 1990–2 which uncovered torc hoards G, H, J, K and L, scattered coin hoard N and the large amorphous silver-copper alloy lumps which form Hoard M. These excavations also revealed a large polygonal enclosure ditch partially surrounding the site. During this period, a large coin hoard, P, was stolen from the site by illicit metal detectorists working without permission of the landowner.

The final main period of discoveries came in 2003–9, when a metal-detecting survey of the wooded western half of the hoard field produced a large number of metalwork and coin finds, as well as revealing the stone footings of the square Roman structure excavated by Hutcheson (2011).

The finds are now cared for by Norwich Castle Museum and the British Museum, and have been brought together here in a single publication for the first time.

Phases of activity

In this volume, activity at the site has been divided into six phases. The evidence from each is summarised below.

Phase 1: Early Neolithic (c. 3650–3400 BC)

The main evidence for Early Neolithic occupation at Ken Hill takes the form of a cluster of seven pits in the vicinity of the hoards, another outlying pit, and areas of burning and/or flint concentrations which are more widely distributed across the site. The pits contained quantities of pottery, likely domestic debris from pre-pit or midden material. The ceramic assemblage is overwhelmingly Early Neolithic, and the lithic assemblage is predominantly Early to Middle

Neolithic. Lithic finds also suggest activity stretching back as far as the Mesolithic period, a possibility supported by earlier stray finds of Mesolithic flakes and points from the immediate vicinity (NHER 1487).

The Early Neolithic pit cluster at Snettisham fits into a wider pattern of similar sites across Norfolk, with well-studied examples at Spong Hill (33km from Snettisham; Healy 1988; 2013) and Kilverstone (55km from Snettisham; Garrow 2006, 40–58). Evidence varies, but generally suggests persistent use of these sites in the form of intermittent occupation events, rather than long periods of continuous settlement. A small pit cluster such as that seen at Snettisham could have developed over a relatively short period. Many activities are attested at these sites; with Garrow (2006, 57) suggesting that they were places where: 'flint was knapped, pots used and broken, fires lit; cereals were processed and wild resources eaten, and we can probably assume that domestic animals were kept.'

It was not possible to carry out radiocarbon dating for this phase, due to an absence of organic material. However, the pit clusters at Kilverstone, which has produced a very similar ceramic assemblage, have been dated to *c.* 3650–3400 BC (Garrow *et al.* 2006, 72), and it is likely that the activity at Snettisham dates to around the same time.

There is very little evidence for later Neolithic activity at the site, although some of the flint may date from this period.

Phase 2: Bronze Age to Earlier Iron Age (c. 2500–350 BC)

There is little evidence for earlier Bronze Age activity at Snettisham, despite the presence of a small number of Beaker sherds, but the site seems to have taken on a special significance in the Late Bronze Age to Earlier Iron Age. There was clearly substantial wider Late Bronze Age depositional activity in the vicinity, with at least five known Late Bronze Age hoards from the surrounding area of Snettisham and Shernborne parishes, one from the site itself (Lawson 2018; NHER 1504, 1670, 1671, 1672, 1679, 17665, 25920, 28136; Treasure case 2006 T441).

Only a small number of surviving features dating to this phase were excavated in 1990–2. Phase 2 ceramics were concentrated in two areas: Trenches 7 and 12 on the southern side of the site, and pit SN25 to the east. Most of the Phase 2 pottery from the southern trenches was found in disturbed deposits. These finds span the Late Bronze Age to Earlier Iron Age, and appear to represent midden material. The broad date range suggests that activity may have taken place over an extended period of time. However, the majority of ceramics from Phase 2 were recovered from pit SN25 (to the east of the metalwork hoards), which contained a large quantity of Earlier Iron Age pottery. This material was probably deposited in a single episode, or derived from a single source, and it may represent a midden deposit from an event associated with food consumption.

The nature of the activity which generated these deposits cannot be ascertained with certainty, but it is possible that they represent communal gatherings or feasting. Although the evidence from Snettisham is on a smaller scale, Percival (this volume) draws parallels with large midden sites in south-central England (Waddington *et al.* 2019). Such long-lived Late Bronze Age to Earlier Iron Age midden sites are rare in eastern England, but Grandcourt Farm, Norfolk (Malone 2010) may represent comparable activity in the vicinity of Snettisham. This unusual site has a large number of pits with extensive evidence for Middle Iron Age structured deposits of pottery, brooches, amber, glass and shale, and lies around 18km to the south of Ken Hill.

The small number of non-ceramic finds from Ken Hill that can be securely dated to Phase 2 are from the wooded area to the west, suggesting that activity in this period may have been concentrated away from the hoard field. The high levels of phosphate in the woods (see **Fig. 5.15**) indicate an area of intensive activity or occupation over about 4,000m^2. This may be related to the Phase 2 midden-generating activity, although it is equally possible that it could be associated with the Phase 3 hoarding activity or the nearby Phase 4 Romano-Celtic temple.

Phase 3: Later Iron Age (c. 350–60 BC)

The most spectacular finds from the site date to the Later Iron Age, Phase 3 (*c.* 350–60 BC), the period which saw the deposition of the torc and coin hoards A, B, C, D, E, F, G, H, J, K, L and N. It is notable that some of these objects were ancient when they were deposited, their use perhaps even stretching back as far as the activities which led to the generation of midden material at the site during Phase 2.

Aside from the hoard pits, no other features can be securely assigned to Phase 3, though it is likely that the enclosure or field system identified through geophysical survey (see Ch. 8, **Fig. 8.2a–b**) was contemporary with the hoards, and may have served to structure movement and activity across the site. The majority of the hoards are located around the entrance into an enclosure which may have defined a shrine or sacred precinct. This enclosure seems to have extended west into what is now the wooded area, and shows high phosphate levels, as discussed above. We have argued in this volume that the torc hoards were buried over quite a short period, ending around *c.* 60 BC. The stray finds of metalwork and coins which date to this period probably predominantly derive from hoard material dispersed by ploughing, other agricultural activity, or animal burrowing. The small quantities of Late Iron Age ceramics from the site are not sufficient to suggest any significant settlement or domestic activity; the main role of the site at this time appears to have been as a place of deposition.

Phase 4: Latest Iron Age/Early Roman (c. AD 1–200)

Snettisham seems to have retained its importance into the earlier Roman period. Two hoards most likely date to the 1st and 2nd centuries AD: the large silver alloy lumps of Hoard M and the night-hawked silver coin hoard, P.

The site was also partially enclosed during this period by a series of deep V-shaped ditches (2.3–2.8m wide at the base of the plough soil, and 1.5–1.8m below the present ground surface). These delimit an area of around 8 hectares, centred on the Phase 3 torc hoards, presumably demarcating an area which was still held to be sacred, or at least considered worthy of recognition. The south side was probably unenclosed, sloping down towards boggy ground

and an inlet from the Wash. Based on pottery analysis and radiocarbon dating, the enclosure ditch seems to have been dug sometime shortly after around AD 100, and began silting from at least the early to mid-2nd century AD.

It was also most likely during Phase 4 that the square stone structure (identified by Hutcheson (2011) as a possible Romano-Celtic temple) uncovered in the wooded area was constructed. It lay directly opposite the entrance to the enclosure on the south-west side. Though there is no evidence that the structure itself was a focus for deposition of any kind, it would have stood between the entrance to the enclosure and the area which produced the hoards. The high levels of phosphate in the wooded area are concentrated just north-west of the temple structure. Romano-British pottery was found in the same area, suggesting that this may have been contemporary with the temple, although it is equally possible that it might be associated with the midden-generating activity from Phase 2 or the Phase 3 depositional activity.

Hutcheson (2011; 2004, 90–2) has argued that in Early Roman Norfolk the building of Roman temples at sites which saw Late Iron Age deposition (such as Snettisham, North Creake and Fring) was a way of formalising a previously more fluid depositional landscape. The transformation of the site at Ken Hill in the Early Roman period would certainly have redefined and perhaps overtly controlled the way in which the site was used and accessed.

The importance of the site may have begun to wane in the 2nd century AD. The Snettisham jeweller's hoard of Roman coins and jewellery was likely buried in the mid-2nd century (with closing coin issues dating to AD 155). It includes small wire fragments that may derive from an Iron Age torc (Johns 1997, 46), suggesting the possibility that some hoards were disturbed around this time.

Phase 5: Late Roman (c. AD 350–400)

There seems to have been a change in the use of the site in the Late Roman period, and perhaps even deliberate abandonment. At the beginning of this phase, it appears that the enclosure ditch was only partially infilled, but there may have been a deliberate attempt to level the inner bank in at least some areas during Phase 5. At the centre of the north side, the enclosure ditch was completely infilled for a length of around 20m with slag and furnace debris, probably to create a causeway across the ditch, suggesting a re-organisation of the layout and use of the site. Pottery finds and radiocarbon dates suggest this occurred in the mid-4th century AD. In the Late Roman period, it is evident that there were a range of industrial processes taking place in the immediate vicinity of Snettisham (see e.g. Lyons 2004), and it is likely that the ironworking which produced the furnace debris filling the north side of the enclosure ditch probably occurred nearby. The square stone structure in the woods was also probably demolished at around this time, with a Roman coin dated AD 350–360 securely lodged under the rubble of the north wall (Hutcheson 2011, 44).

There is little evidence for early medieval activity at Ken Hill, and so it may be that this was the final decommissioning of a site that had seen exceptional objects deposited for a period of at least a century from the Late Iron Age to the Early Roman period.

Phase 6: Medieval and post-medieval (c. AD 1100 onwards)

Ceramic evidence suggests 12th to 14th-century occupation in the vicinity, although no excavated features could be securely dated to this period. The evidence from the 1990–2 excavations suggests that Phase 6 interventions at the site mainly consisted of post-medieval agricultural and drainage activity.

The disturbed state of many of the archaeological features across the site was due to animal burrowing (especially rabbits), and deep ploughing across the hoard field. From at least the 16th century, an area of common land just south of Ken Hill was used as a rabbit warren, and there are numerous historical accounts of the problems caused on adjacent agricultural land around Snettisham by escaping rabbits (Whyte 2009, 91–124; Bailey 1988). Extensive disturbance was also noted in the wooded area to the west of the 'gold field' by Hutcheson during her 2004 excavations (2011). She suggested that this could be due to deliberate destruction of the site and structure, but it is possible that it simply results from later agricultural, drainage, landscaping and animal activity.

The Late Iron Age finds

The Phase 3 hoards and most of the Late Iron Age stray finds from Snettisham represent almost exclusively a small number of artefact types, mostly associated with personal ornament. The majority are torcs, bracelets, small and large rings, and coins. There is also evidence for highly fragmented sheet objects, and categories of find seemingly associated with metalworking such as a scale pan, perforated pebble (perhaps for working with wire), and ingots. There are hints of possible martial associations in hoards B/C and F, with the inclusion of a shield binding in B/C and F being contained within an unusual form of bronze helmet.

The stray finds likely associated with the same period of activity generally represent material comparable to that contained within the hoards: a small number of complete or near-complete gold/silver alloy multi-strand torcs, fragments of both tubular and multi-strand torcs in a range of alloys (some deliberately broken up or exposed to heat), ingots and rings, as well as amorphous copper alloy lumps, sprues from casting, bronze sheet fragments and small bronze rivets and rivet heads.

Additionally, a handful of (mostly copper alloy) stray finds represent object types likely dating to Phase 3, but not seen in the hoards: a terret, a linch-pin head, two brooch fragments, an unusual mount, a small pair of tweezers, and one possible loop from a button and loop fastener or strap fitting. There are also a small number of fragments of mail armour, most likely of a Late Iron Age to Early Roman date. The under-representation of strap fittings, brooches, fasteners, and toiletry items related to personal grooming is notable compared to most contemporary Late Iron Age sites. There are also no finds of animal bone, human remains, or tools from the site that can be dated to Phase 3, and very little pottery.

The torcs

The most spectacular objects from Snettisham, and those which make the site exceptional, are undoubtedly the torcs and related ornaments. There are over 60 complete or near-complete torcs from the site, with hundreds more represented by fragments. This compares to around 85 complete and fragmented Iron Age torcs in total from the rest of the UK.

There is huge variety in the materials and manufacturing techniques used in the production of these objects. Tubular torcs in a wide range of forms were made in gold sheet, while bronze and gold/silver alloy multi-strand torcs instead use wire as the primary material for their neck-rings. On the multi-strand neck-rings, prominent terminals were either formed from the ends of the neck-ring wires, cast directly onto the wires, cast separately and soldered/riveted on, or made in sheet and soldered or mechanically attached to the neck-rings. Both wire neck-ring construction and terminal form are hugely varied, making almost every torc unique. Colour was evidently important in the selection of alloys and surface treatments, with precious metal torcs being made in a wide range of ternary alloys of gold, silver and copper, often showing surface enrichment of their precious metal content to give colours from yellow gold to very pale, whitish silver. Some copper alloy torcs had even been mercury gilded to give them a golden surface appearance, the earliest known example of this technology in Britain. The manufacture of torcs used a wide variety of materials, including organic components such as wooden cores which enabled the construction of coiled wire neck-rings.

Many of the torcs were decorated, making the finds from Snettisham one of the densest known concentrations of Celtic art. It is no surprise that these finds have featured prominently in almost every account of Celtic art since their discovery. The decoration is highly varied, also including geometric motifs only rarely otherwise found on Iron Age metalwork. Several objects show motifs generally ascribed to different phases or stages of Celtic art, adding to an emerging understanding that later styles of Celtic art were more an accumulation of designs and motifs than a wholesale replacement of earlier styles. The anachronistic nature of some of the designs might have been deliberate, creating connections between past, present and even the future for the communities that made and used these objects (Joy 2016; 2019a; 2020). The wide variety of textures and patterning hints at the fact that torcs were designed to be seen from a range of viewpoints. Some elements could be appreciated from a distance, but others would only have been visible to those who had personal access to the objects, close enough to see and even touch the intricate designs. Today, it is only possible to appreciate some of these objects because of meticulous conservation work undertaken at the British Museum.

Location or even region of manufacture of the torcs is hard to determine with any certainty. Most of the torcs and fragments from Snettisham, especially the multi-strand examples, are in styles best paralleled in Britain. They are probably insular products, if not more locally made, given the preponderance of these types in East Anglia (see **Fig. 22.4a**). Many of the tubular torcs are so unusual that it is impossible to be certain about their origins, but the art styles on the more ornate pieces (e.g. A.1, F.43, see **Tables 21.2–3**) are most commonly seen on objects from Britain (see Ch. 21). This suggests that while objects such as the Type 6 tubular torcs from Hoard A are part of a wider distribution of such types across north-west Europe (see **Fig. 22.3**) the majority of the tubular torcs from Snettisham may well have been made in Britain, even though in some cases they are local versions of a widespread style. The undecorated Type 1 and 2 tubular torcs are harder to place, and objects such as F.59 and F.63–6 are perhaps the most likely examples of imported objects in the hoards, along with stray finds such as S.83, a small zoomorphic rod torc fragment with its closest parallels on the continent (Ch. 21).

Evidence from both stylistic analysis, studies of wear and repair, and radiocarbon dating suggests that at least some torcs were over a century old before they were deposited. Thus, their lives extended beyond any single human lifespan. Whether they were passed down the generations as heirlooms, stood for a specific role potentially held by a number of individuals, or were held in a communal treasury, by the time they were placed into the ground they must have accumulated their own rich histories and networks of relationships. Many of these objects are highly distinctive, and it is hard not to imagine that they would have been known and recognised entities in their communities.

There has been much discussion over the social role of torcs and other ornaments in Late Iron Age societies. Who wore these objects? Were these high-status, prestige objects accessible only to a small number of powerful individuals, perhaps local leaders? Or were they communal possessions associated with roles, rites or offices which could be held by different people at different times? With very little evidence available from contemporary burials, some of these questions may remain impossible to answer, but close analysis of the objects themselves provides some clues. The range of neck-ring sizes present at Snettisham suggests that they were most likely worn by a wide range of people, including young people and adult men and women. The smallest torcs (suitable in size for an adolescent or, possibly, worn on the upper arm) tend to be simpler in design and construction, but more decorative torcs come in a wide range of adult neck sizes. Many torcs were heavily worn and repaired, suggesting wear over a very long period, most likely by more than one individual. There is also the clear suggestion from damage to neck-rings and terminal attachments that torcs were taken on and off continually over their lifetimes. This could be as simple as one careful owner removing the object at night but may also suggest wear by different people or for specific events. Torcs from other sites in Britain often show preferential wear on one side, showing that they were generally worn one particular way up. This does not tend to be the case at Snettisham. This is not definitive, but might suggest different wearers, or at least gaps between periods of wear.

Here, we have argued that torcs were active objects which played a part in the construction of identities. Putting on a torc transformed the wearer and may have allowed them to step into roles or positions of power that they did not occupy on a daily basis. Other forms of archaeological evidence

from Late Iron Age Norfolk, such as settlement pattern data, are often ephemeral, but there is little evidence for a rigidly structured hierarchical society, or an extensive single political entity. Power structures may have been relatively fluid, local, and perhaps heterarchical. Torcs, and who had the right to wear them, would have played a role in the creation, negotiation and maintenance of these relationships.

The structure and dating of the hoards

The torc hoards from Snettisham are very varied in form. Broadly speaking they can be divided into two groups: the fragmentary hoards B, C and F (which contain cut up torcs, very few complete objects, and potin or gold alloy coinage), and the complete torc hoards A, G, H, J, K and L. In the latter, where they have been recovered under excavation conditions, torcs were placed into the ground in nested groups, either in tight stacks (G, H, J, K) or more widely spaced in a larger pit (L, which is also the most spectacular of the hoards). Three hoards show clear evidence of multiple stages of deposition: G, H and L all have clear upper and lower pits.

The Phase 3 hoards are summarised here:

Hoard A: At least four tubular torcs, and a perforated pebble possibly associated with wire manufacture or finishing.

Hoards B and C: A small number of complete, simple multi-strand bronze torcs and a similar bracelet. Fragmentary multi-strand torcs/bracelets in a range of gold/silver alloys as well as bronze, accompanied by other objects including both large and small rings, ingots, fragments of shield binding, other unidentifiable sheet fragments, and a folded scale pan used for weighing out small quantities of material. Hoard B included at least one composite group of multi-strand torc fragments and rings looped onto a larger ring. Hoard B also contained gold Gallo-Belgic coins and one insular quarter stater, while Hoard C included over 150 potin coins.

Hoards D and E: Each comprises one composite group based around a complete multi-strand torc. In the case of Hoard E (the 'Great Torc') a single gold insular quarter stater had been inserted into one of the terminals.

Hoard F: The largest hoard from the site, consisting almost exclusively of fragmentary multi-strand torcs/ bracelets in a range of gold/silver and bronze alloys, as well as fragments of gold alloy tubular torcs in a variety of types. Many of these were interlinked to form composite groups, and some show evidence of melting or exposure to molten metal. The assemblage also included rings, ingots and Gallo-Belgic gold coins and was contained within an upturned copper alloy helmet.

Hoards G, H, J, K, L: Nested hoards primarily of complete multi-strand torcs in a range of gold, silver and bronze alloys. Also includes some fragmentary torcs, and interlinked groups. Hoard G included four large rings at the base of the pit, and one of its upper torcs had small rings inserted through its terminals. Hoards G, H and L have evidence for two pits, upper and lower, while Hoards J and K had been truncated by ploughing.

Hoard N: Dispersed hoard of nine Gallo-Belgic gold coins.

Dating of the hoards is not straightforward. The majority of the Phase 3 hoards (A, D, G, H, J, K and L) contained only torcs and other ornaments/metalwork such as wrought rings of various sizes. Hoards B, C, E and F were torc hoards (mostly fragmentary, except for E) which also included coinage, and Hoard N was a dispersed coin hoard. The dating of the coins from hoards B, C, E, F and N support the idea that these hoards were more or less contemporary. The Hoard B, E, F and N coins are Gallo-Belgic gold (with two possible insular gold issues), while those from Hoard C are potins. The latest potins in Hoard C are dated by Holman (Ch. 15) to *c.* 75/70–60/55 BC, with the composition of the assemblage suggesting that the hoard was deposited around 60 BC or shortly thereafter. The Gallo-Belgic gold coins from Hoards B, E, F and N terminate with issues minted *c.* 80–60 BC (see Ch. 15 for a full discussion of coin dating). Gallo-Belgic E coins (the predominant gold coinage in circulation *c.* 60–50 BC) are, notably, absent from the hoards. As no objects from the torc hoards can be securely dated to after *c.* 60 BC, this is taken as a likely terminal date for their deposition. Stray finds suggest the possibility that there were continued (albeit apparently much smaller) deposits of coinage at the site in the later 1st century BC, but none of these were found in a closed context.

It is more difficult to establish a date for the beginning of hoarding at Snettisham. In terms of the types and styles of torcs represented, it is not possible to order the hoards chronologically. Aside from Hoard A, which contained exclusively large tubular torcs, the range of torcs contained within each hoard is broadly similar, and it is clear that many torcs were in circulation for a long time, perhaps generations, before deposition. Organic material from two torcs (one from Hoard F and one from Hoard L) was used to provide radiocarbon dates (see **Table 5.2**; Garrow *et al.* 2009), giving results of *c.* 370–110 cal BC at 95% probability, and 350–170 cal BC at 68% probability. Given the associated coinage from Hoard F, some of the objects in the hoard were most likely over a century old at the time of burial.

The clustering of the latest dates for hoard coins in the early to mid-1st century BC (Hoards B, C, E, F and N) strongly suggests at the very least a peak of deposition at this time, but the nested torc hoards could in theory have been buried en masse over a relatively short length of time, or gradually over a much longer period. There could even have been decades between some of these deposits. Here, a date of *c.* 350–250 BC is cautiously offered as an indication of the earliest possible date of deposition for the hoards which cannot be given a *terminus post quem* through coinage (A, D, G, H, J, K and L). However, the editors of this volume favour a significantly tighter chronology focused around *c.* 60 BC.

Whilst none of the assemblages which do not contain coins can be closely dated, the close relationship between both the objects and the structuring of the deposits seems to argue for a relatively compressed timeframe for their burial. Within the nested torc hoards, at least three or four groups of deposit can be identified: the spectacular lower deposit of Hoard L is without parallel, although the bases of Hoards J and K (their upper layers heavily disturbed by ploughing) may be smaller, less ornate, more tightly stacked versions of similar assemblages. The lower pits of Hoard G and H are very similar to one another, with simple, largely copper alloy

Figure 24.1 Imaginative reconstruction of the deposition of one of the torc hoards at Snettisham (drawing by Craig Williams)

objects towards the base and each capped with a single silvery-gold-coloured torc, between them representing a wide range of sizes. The upper deposits of Hoards G, H and L form the final group, each a tightly stacked set of silver-rich and copper alloy torcs, including coiled buffer terminal examples, and representing a narrower range of diameters.

The similarities between the upper pits of G, H and L are such that it seems likely that their depositors were aware of one another, and were perhaps present for all three occasions. Likewise for the lower deposits of G and H, which are too similar for this to be mere coincidence. And if the capping of the upper pit of Hoard L with a torc which echoed the first placed in the lower pit was intentional, then it suggests that those who made these upper deposits were closely aware of the earlier ones. It is also possible to suggest connections between the nested hoards and the fragmentary ones (though no joins have been identified). The only assemblage that cannot be tied into this series is Hoard A, also the most spatially separated, making it the strongest contender for an earlier or later deposit.

Why were the hoards buried?

Previous interpretations of the site (e.g. Clarke 1954; Stead 1991a) have tended to view the hoards as a communal treasury, buried in a time of stress (perhaps related to Caesar's incursions into southern Britain), with the intention of recovery. Here we follow Fitzpatrick (1992a) in arguing that the clear division between founders' or savings hoards (intended for recovery) and votive hoards (intended to be left undisturbed) is perhaps anachronistic when applied to Iron Age Britain. Nonetheless, the Snettisham hoards, whilst exceptional, fit into a clear wider pattern of unrecovered coin, torc, vessel and harness fitting hoards across Late Iron Age Norfolk (Hutcheson 2005; Davies 2008). Many of these deposits, including the excavated hoards at Snettisham, show structure and patterning which strongly suggests that selecting, collecting and depositing material was not a hurried act but a carefully considered process and perhaps even a staged performance. Certainly, the strong relationships between Hoards G and H at Snettisham, and the echoes/connections between the upper and lower pits of Hoard L speak to the wider social significance of the act of placing these objects in the ground, a process imagined in **Figure 24.1**. We view these as curated individual deposits buried at a sacred site, and understand the creation of these hoards as a social process which actively established, negotiated and performed meaning and networks of relationships between people and objects.

The sense of torcs as active objects in the negotiation and display of power may go some way to suggesting why these objects were taken out of circulation in the late Iron Age. The number of torcs buried at Snettisham is unprecedented, and there must have been a powerful motivation behind the interment of so many objects at a single site, perhaps over a

relatively short period of time in the years or decades leading up to *c.* 60 BC. Other coin evidence from the site supports the idea that deposition continued to take place over the following century (culminating in the burial of large revolt-period coin hoard, P, around AD 60/61) but none of these later deposits contain torcs.

Mixed hoards of torcs and coins are widespread across much of Europe in the 1st century BC (Fitzpatrick 2005). Often, torcs and coins are present in similar quantities by weight of metal, or torcs (often fragmented) are just a small proportion of a larger coin hoard. In these cases, torcs and coins seem to be treated more or less equally, with an equivalence perhaps drawn between the two. In some cases, the torcs (and even the coins) may represent a source of scrap metal. The pattern is different at Snettisham, where torcs and coins are not treated interchangeably. In a small number of cases torcs and coins are directly associated (with a gold quarter stater inside one of the terminals of the Great Torc in Hoard E, and Gallo-Belgic gold coins found sealed inside a broken fragment of tubular torc in Hoard F). However, none of the nested hoards of complete torcs contained coins, and coins only ever represent a small proportion of the fragmentary hoards.

The precious metal which formed the raw material of many of the Snettisham torcs is eminently recyclable. Indeed, it is most likely that these objects were themselves made from recycled imported Gallic gold, arriving in Britain as ornaments or coins. No direct connections have been discovered between fragmentary objects in different hoards, or composite groups within hoards, and so there is the clear implication that only parts of some objects were being deposited. The rest of these objects could have been deposited somewhere else or (more likely given the vast number of partial objects at Snettisham and the fact that no associated fragments have been discovered elsewhere) recycled into a new form. Northover (this volume) argues that the composition of the small and large rings from the site suggests they may have been made from melted down torcs. Aside from these rings, the most likely contender for the fate of recycled torc metal is coinage. The period around *c.* 60 BC which seems to have seen the bulk of torc deposition at Snettisham coincides with the beginnings of local gold coin production in East Anglia. The precise source of the metal used for early East Anglian gold coins is unknown, but their composition is consistent with a production route that included the recycling of imported continental Gallo-Belgic E issues and some incorporation of recycled metal from torcs.

Following Gosden (2013), we argue that the shift from a 'world of torcs' to a 'world of coins' is fundamental to understanding the deposits at Snettisham. Torcs are powerful objects, worn on the body, perhaps associated with individual people, families or communities. They may have been worn at particular events, ceremonies or celebrations, perhaps even denoting a specific role or office held by the wearer (at least while they wore the torc). The huge range of torcs at Snettisham strongly suggests that their value lay in their singularity: almost every torc from the site is unique and many are highly recognisable, even from a distance. These may well have been objects with rich histories and layers of meaning, even their own names and stories which not only connected but also reached beyond the people who wore them.

Coins are a different matter altogether. Coinage was a new way of demonstrating wealth, status and connections, arriving in southern Britain in the 2nd century BC (a time when torcs were possibly already widespread, although few from this early period seem to have been deposited). Coins became more common in the early to mid-1st century BC. The coins found in torc hoards at Snettisham represent some of the earliest types from East Anglia. Coinage would not become widespread here until the 50s BC, when Gallo-Belgic E was introduced, and local production began. Coins are portable, and easily distributed among many people. Their value lies in their multiplicity, standardisation and reproducibility. Issuing a batch of coinage was a physical manifestation of a very particular (and possibly new) form of authority. An individual or group had to gather the raw materials and resources, as well as needing access to the required labour and knowledge. What was created was not a single ornament that could only be worn by one person at a time, and only seen by those present nearby, but a mass of standardised discs literally stamped with images denoting the authority of the issuer(s). Distributing coinage was a way to mark and create alliances, political affiliations and connections; coins were physical symbols of a system of power and allegiance that could be carried by and shared among many people. In this new 'world of coins', torcs, or at least the social relations and power networks they represented, may have seemed outdated.

The shift from torcs to coins as symbols and mechanisms of negotiating power and status may have been slow, perhaps taking place over decades, with objects such as early non-local coinage and simple wrought rings taking on an intermediate role. However, the mid-1st-century BC expansion of local coin production coincides with a tide mark in the hoard evidence: many torcs were seemingly buried at this time. But why were they buried, rather than being recycled into new symbols of power? The long histories of many of the objects from Snettisham suggests an answer: were these objects simply too potent to be absorbed into the standardised world of coinage, where one batch must, by definition, be equal to another? The torcs from Snettisham were powerful objects in their own right, entangled (perhaps problematically so) with people, power structures, and relationships.

In this sense, burying these objects can be seen not as ending their lives, but as transforming potent objects into a different kind of potential. The careful structuring of hoards such as G, H and L, and the large and diverse collection(s) represented by Hoard F hint that the very act of collecting and depositing these objects was a sphere in which power and relations could be created, negotiated and enacted anew: the hoards were transformational. Taking these objects out of circulation created space for a new kind of object, coinage, and with it new forms of authority and new kinds of interaction between people, objects and materials.

These new systems of power may have been referenced through the later (Phase 4) hoards from the site. Hoard M consisted of a group of large, amorphous lumps of silver-copper alloy, with embedded lumps of charcoal. The

incorporation of these objects within the enclosed area of the hoard field seems to suggest a deliberate connection to the transformative potential of metalworking processes. Hoard P was a large assemblage of (mostly silver) 1st-century AD coinage, likely deposited around AD 60/61 or shortly thereafter. This fits into wider patterns of deposition across Norfolk at this time, when coinage became the favoured material for inclusion in hoards.

Why Snettisham?

If torcs were being taken out of circulation to make way for coinage, the question remains as to why so many were deposited at a single site, and why Snettisham was chosen. The finds from the 'gold field' are unprecedented, but they do fit into wider patterns of torc deposition around this time across southern Britain. East Anglia, and especially Norfolk, has the largest number of finds, and it is clear that torcs (or at least torc deposition) were particularly important in this region. Late Iron Age hoards are well attested across Norfolk, often being located at high points with views across rivers or the sea (Hutcheson 2005; Davies 2008).

Ken Hill meets all these criteria and more. It is located in north-west Norfolk, one of the densest areas for Late Iron Age hoarding (even taking Snettisham out of the equation), and is not just a high point but a very significant landmark: a distinctively shaped hilltop promontory reaching out into the Wash. It is an unusual and conspicuous feature, visible from some way in either direction along the coast in a landscape that otherwise consists mainly of flat, low-lying, marshy ground. In the Late Iron Age, it would have been surrounded by water on three sides, commanding views across the North Sea to the north and east, falling away to the Wash in the west, curling around an inlet so that the southern side of the hoard field sloped away down to the water. This was also a place where freshwater running down from the chalk ridge near Shernbourne met the saltwater of the Wash. Whilst today north-west Norfolk is a relatively rural area, this was a well-populated region in the Iron Age, with productive agricultural land and rich in fenland resources such as wildfowl, salt and reeds for thatch and other crafts. Its inhabitants were well connected to other regions of Iron Age southern Britain via the Icknield Way, across the Wash to Lincolnshire, and via the North Sea to the continent, perhaps accessed via the Rhineland Delta. Many of the objects from Snettisham speak of these connections, including the beautifully decorated tubular torcs from Hoard A which find their closest parallels in the Low Countries.

By the Late Iron Age, Snettisham had a history as a special site, with evidence of possible feasting activity going back at least as far as the Earlier Iron Age, and perhaps even prior periods. It was well suited for torc deposition in terms of location and setting. It may be that such practices were in some ways self-reinforcing: that torcs were not just buried at Ken Hill because it was an important place, but that Ken Hill in part drew its increasing importance from the fact that it became a socially sanctioned place to bury torcs. These were potent objects which people were motivated to take out of circulation, and there must have been a need for appropriate places and events at which to do so.

The resulting hoards are exceptional archaeological assemblages today, and the scale of deposition at the site must surely have been exceptional even at the time. Neighbouring sites such as Sedgeford, perhaps part of an interconnected landscape of settlement and deposition, are nowhere near approaching the richness of the Snettisham finds, and there is nothing like them from elsewhere in the UK or Europe.

Who gathered here to make these deposits? Given the hundreds of torcs represented at the site, these must surely have been drawn from the possessions or collections of many people and probably several communities. It seems likely that the site drew visitors from across much of north-west Norfolk at the very least. Was it also an inter-regional centre drawing together people from across Britain and perhaps even beyond? Certainly the people who owned and used the objects found at the site were well-connected. The coins assemblage suggests wide regional networks reaching to the south and east. The types of torcs found at Snettisham would not be out of place elsewhere in southern and western Britain (in the case of multi-strand torcs) or the near continent (for tubular torc types), but the very nature of these widespread styles makes it hard to narrow down their origins. There are close connections between many of the objects in terms of the metalsmithing techniques used, but these are nonetheless varied enough to make it highly plausible that several different workshops, and certainly many individuals given the long potential timeframes, were involved in their production.

Bringing these objects together in carefully structured deposits at a site with a long history of importance and a distinctive topographic location was likely a way of recognising and building new relationships and allegiances, as well as marking the end of an older system of social authority. The torcs themselves were laid to rest, but the stories they embodied may not have been forgotten. Over a century after the main period of deposition at the site, it was demarcated by a large-scale ditched enclosure, with the area of the hoards at its centre, suggesting that the significance of the site continued for generations after the hoards were buried.

Appendix 3
Concordance of Finds

Over the years, a large number of different cataloguing systems have been used to order and understand the material from Snettisham. This volume represents the first attempt at a unified metalwork catalogue, and so a new numbering and ordering system has been introduced, covering all finds.

Previous numbering and codes are included in individual catalogue entires, but to allow for easier cross-referencing with previous publications, full concordances with all known previous cataloguing systems are given here.

The main concordance, ordered by the catalogue numbers used in this volume, includes information about the museum where the object is held, registration number, published references in previous catalogues (Clarke 1954 and Burns 1971), the four-letter site codes assigned to material excavated in 1990–2 ('Stead code'), the numbers given by Ralph Jackson to finds recovered by Hodder in 1990 when they were brought into the BM ('Jackson no.'), as well as 'Ticket nos' assigned to NCM material by Farley in 2021 (see Ch. 1 for a full discussion of all these systems and codes).

For each object, a summary is also given of key information such as findspot, context details, object name, multi-strand torc/bracelet construction code (MSCC, see Ch. 13) or tubular torc type, terminal type, material, and any known joining or related fragments. The intention is to assist the reader, and future researchers, in navigating these complicated assemblages. To this end, the summary of hoards in Chapter 11, and **Table 11.1** which orders the material by find type rather than hoard, will also be useful.

Whilst a concordance with the two simultaneous cataloguing systems used by Clarke (1954) is included in the main concordance for the material he published (Hoards A–E), the correspondence with these is complicated. Thus, for those who wish to make a more detailed referencing between these publications, a final more detailed concordance with Clarke (1954) is also included, with two tables, ordered according to Clarke's own systems, one numbering the finds by hoard, and one ordering them by object type.

Cat no.	Museum	Reg. no.	Ticket no.	Published ref.	Stead code	Ralph no.	Ex. year	Findspot	Context details	Object name	MSCC or TUB torc type	Torc terminal type	Material	Joining / related fragments?
A.1	NCM	1949.74.2		Clarke 1954, 37; pls i, ii; Tubular Torc 1			1948	Area 8	Hoard A; found during ploughing	Torc	TUBULAR (Type 6)	BUFFER	Gold alloy; iron	
A.2	NCM	1949.74.1		Clarke 1954, 38; pls i, ii; Tubular Torc 2			1948	Area 8	Hoard A; found during ploughing	Torc	TUBULAR (Type 6)	BUFFER	Gold alloy	
A.3	NCM	1949.74.3		Clarke 1954, 38–9; pls i, ii; Tubular Torc 3			1948	Area 8	Hoard A; found during ploughing	Torc	TUBULAR (Type 6)	BUFFER	Gold alloy	
A.4	NCM	1949.74.6		Clarke 1954, 39; Tubular Torc 4			1948	Area 8	Hoard A; found during ploughing and Rainbird Clarke excavations	Torc	TUBULAR (Type 6)	BUFFER	Gold alloy; iron	A.4–A.7 may be from the same torc
A.5	NCM	1949.74.4		Clarke 1954, 39; pl. i; Tubular Torc 4			1948	Area 8	Hoard A; found during ploughing	Torc	TUBULAR (Type 6)	BUFFER	Gold alloy	A.4–A.7 may be from the same torc
A.6	NCM	1949.74.5		Clarke 1954, 39, pl. i; Tubular Torc 4			1948	Area 8	Hoard A; found during ploughing	Torc	TUBULAR (Type 6)	BUFFER	Gold alloy	A.4–A.7 may be from the same torc
A.7	NCM	1949.74.		Clarke 1954, 39, pl. i; Tubular Torc 4			1948	Area 8	Hoard A; found during ploughing	Torc	TUBULAR (Type 6)	BUFFER	Gold alloy	A.4–A.7 may be from the same torc
A.8	NCM	1949.74.7		Clarke 1954, p. 39; fig. 6			1948	Area 8	Hoard A; found during ploughing	Gritstone pebble			Stone	
B.1a	NCM	1949.75.24	BLUE.14	Clarke 1954, 54, no. 14; pl xii, in group; Hd. B no. 7			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Large ring			Gold/silver alloy	
B.1b	NCM	1949.75.17	BLUE.16	Clarke 1954, 54, no. 13; pl. xii, in group; Hd. B no. 6			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Large ring			Gold/silver alloy	
B.1c	NCM	1949.75.9	BLUE.19	Clarke 1954, 56, no. 12; pl. xii, in group; Hd. B no. 10			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Small ring			Gold/silver alloy	
B.1d	NCM	1949.75	BLUE.21	Clarke 1954, 55, no. 1; pl xii, bottom right of group; Hd. B no. 12			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Small ring			Copper alloy	
B.1e	NCM	1949.75.72	BLUE.22	Clarke 1954, 46, no. 1; pl. xii, top left of group; Hd. B no. 13			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Torc/bracelet		LOOP	Gold/silver alloy	
B.1f	NCM	1949.75.37	BLUE.24	Clarke 1954, 46, no. 3; pl. xii, no. 3 and in group, centre right; Hd. B no. 15			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Torc/bracelet	(5C)R		Gold/silver alloy	
B.1g	NCM	1949.75.40	BLUE.25	Clarke 1954, 46, no. 4; pl. xii, no. 4; Hd. B no. 16			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Torc/bracelet	(4C)Q		Gold/silver alloy	
B.1h	NCM	1949.75	BLUE.126	Clarke 1954, 56, no. 14; pl xii, bottom left of group; Hd. B no. 11			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Small ring			Gold/silver alloy	
B.2	NCM	1949.75.38	BLUE.23	Clarke 1954, 46, no. 2; pl. xii, no. 2; Hd. B no. 14			1948	Area 1	Hoard B; found during ploughing	Torc/bracelet	(2P)R		Gold/silver alloy	
B.3	NCM	1949.75.48	BLUE.29	Clarke 1954, 47, no. 8; pl. ix; Hd. B no. 20			1948	Area 1	Hoard B; found during ploughing	Torc/bracelet	(2P)R		Gold/silver alloy	
B.4	NCM	1949.75.41	BLUE.28	Clarke 1954, 47, no. 7; pl. xii; Hd. B no. 19			1948	Area 1	Hoard B; found during ploughing	Torc/bracelet	(?2P)R		Gold/silver alloy	
B.5	NCM	1949.75.15	BLUE.30	Clarke 1954, 47, no. 14; pl. ix; Hd. B no. 21			1948	Area 1	Hoard B; found during ploughing	Torc/bracelet	(2P)T	LOOP	Gold/silver alloy	
B.6	NCM	1949.75	BLUE.46	Clarke 1954, 47, no. 15; pl. ix; Hd. B no. 22			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Wire/?torc/ ?bracelet	(?P)F		Gold/silver alloy	
B.7	NCM	1949.75.39	BLUE.44	Clarke 1954, 46, no. 5; Hd. B no. 17			1948	Area 1	Hoard B; found during ploughing	Torc/bracelet	(?3C)R		Gold/silver alloy	
B.8	NCM	1949.75.16	BLUE.27	Clarke 1954, 46, no. 6; pl. ix; Hd. B no. 18			1948	Area 1	Hoard B; found during ploughing	Bracelet	(?3P)R		Gold/silver alloy	
B.9	NCM	1949.75	GREY.96	Clarke 1954, 47, no. 20; Hd. B no. 24			1948	Area 1	Hoard B; found during ploughing	Torc/bracelet		?LOOP	Gold/silver alloy	
B.10	NCM	1949.75	GREY.74	Not in Clarke 1954			1948	Area 1	Hoard B; found during ploughing	Wire/?torc/ ?bracelet			Gold/silver alloy	
B.11	NCM	1949.75.30	BLUE.32	Clarke 1954, 47, no. 19; pl. ix; Hd. B no. 23			1948	Area 1	Hoard B; found during ploughing	Torc/bracelet	(2P)R	LOOP	Copper alloy	
B.12	NCM	1949.75	GREY.81	Not in Clarke 1954			1948	Area 1	Hoard B; found during ploughing	Wire/?bracelet			Gold/silver alloy	B.12 and B.13 may be part of the same object.
B.13	NCM	1949.75	GREY.80	Not in Clarke 1954			1948	Area 1	Hoard B; found during ploughing	Wire/?bracelet		?LOOP	Gold/silver alloy	B.12 and B.13 may be part o the same object.
B.14	NCM	1949.75	BLUE.48	Not in Clarke 1954			1948	Area 1	Hoard B; found during ploughing	Torc/bracelet	(?3P)R		Copper alloy	

Cat no.	Museum	Reg. no.	Ticket no.	Published ref.	Stead code	Ralph no.	Ex. year	Findspot	Context details	Object name	MSCC or TUB torc type	Torc terminal type	Material	Joining / related fragments?
B.15	NCM	1949.75	GREY.48	Clarke 1954, 47, no. 20; Hd. B no. 24			1948	Area 1	Hoard B; found during ploughing	Wire/?torc / ?bracelet			Copper alloy	
B.16	NCM	1949.75	GREY.100	Clarke 1954, 47, no. 21; Hd. B no. 25			1948	Area 1	Hoard B; found during ploughing	Wire/?torc / ?bracelet			Copper alloy	
B.17	NCM	1949.75	GREY.88	Clarke 1954, 47, no. 20; Hd. B no. 24			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Torc/bracelet		?LOOP	Copper alloy	
B.18	NCM	1949.75	GREY.83	Not in Clarke 1954			1948	Area 1	Hoard B; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
B.19	NCM	1949.75	GREY.82	Not in Clarke 1954			1948	Area 1	Hoard B; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
B.20	NCM	1949.75.13	BLUE.127	Clarke 1954, 54, no. 12; Hd. B no. 5			1948	Area 1	Hoard B; found during ploughing	Large ring			Gold/silver alloy	
B.21	NCM	1949.75; 1949.75.26	BLUE.6-8	Clarke 1954, 54, no. 11; Hd. B no. 3			1948	Area 1	Hoard B; found during ploughing	Large ring			Gold/silver alloy	
B.22	NCM	1949.75	BLUE.9-10	Clarke 1954, 54, no. 11; Hd. B no. 3			1948	Area 1	Hoard B; found during ploughing	Large ring			Gold/silver alloy	
B.23	NCM	1949.75	BLUE.11-12	Clarke 1954, 54, no. 11; Hd. B no. 3			1948	Area 1	Hoard B; found during ploughing	Large ring			Gold/silver alloy	
B.24	NCM	1949.75; 1949.75.84	BLUE.3-5	Clarke 1954, 54, no. 15; Hd. B no. 4			1948	Area 1	Hoard B; found during ploughing	Large ring			Gold/silver alloy	
B.25	NCM	1949.75.46	BLUE.20	Clarke 1954, 56, no. 11; pl xii; Hd. B no. 9			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Small ring			Gold/silver alloy	
B.26	NCM	1949.75.51	BLUE.2	Clarke 1954, 58 (cake), no. 2; pl. xiii, upper; Hd. B no. 2			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Ingot			Gold/silver alloy	
B.27	NCM	1949.75	BLUE.1	Clarke 1954, 58 (cake), no. 1; pl. xiii, upper; Hd. B no. 1			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Lump ingot			Gold/silver alloy	
B.28	NCM	1949.75.41	BLUE.17	Clarke 1954, 58 (Misc.), no. 1; pl xiii, lower, Misc. 1; Hd. B no. 8			1948	Area 1	Hoard B; found during Rainbird Clarke excavations, Trench 2	Clamp			Copper alloy	
B.29	NCM	1949.75	BLUE.121	Clarke 1954, 58 (Misc.), no. 3; Hd. B no. 26			1948	Area 1	Hoard B; found during Rainbird Clarke excavations	Nail			Iron	
B.30	NCM	1949.75	BLUE.122	Clarke 1954, 58 (Misc.), no. 3; Hd. B no. 26			1948	Area 1	Hoard B; found during Rainbird Clarke excavations	Nail			Iron	
B.31	NCM	1949.75	BLUE.123	Clarke 1954, 58 (Misc.), no. 3; Hd. B no. 26			1948	Area 1	Hoard B; found during Rainbird Clarke excavations	Nail			Iron	
B.32	NCM	1949.75	BLUE.124	Clarke 1954, 58 (Misc.), no. 3; Hd. B no. 26			1948	Area 1	Hoard B; found during Rainbird Clarke excavations	Nail			Iron	
B.33	NCM	1949.75	BLUE.125	Clarke 1954, 58 (Misc.), no. 3; Hd. B no. 26			1948	Area 1	Hoard B; found during Rainbird Clarke excavations	Nail			Iron	
C.1	NCM	1949.75	BLUE.43	Clarke 1954, 47, no. 12; Hd. C no. 16			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(4C)R		Gold/silver alloy	C.1–5 may be from the same torc
C.2	NCM	1949.75	BLUE.41	Clarke 1954, 47, no. 12; Hd. C no. 16			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(4C)R		Gold/silver alloy	C.1–5 may be from the same torc
C.3	NCM	1949.75	BLUE.39	Clarke 1954, 47, no. 12; Hd. C no. 16			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(4C)R		Gold/silver alloy	C.1–5 may be from the same torc
C.4	NCM	1949.75	BLUE.40	Clarke 1954, 47, no. 12; Hd. C no. 16			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(4C)R		Gold/silver alloy	C.1–5 may be from the same torc
C.5	NCM	1949.75	BLUE.42	Clarke 1954, 47, no. 12; Hd. C no. 16			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(4C)R		Gold/silver alloy	C.1–5 may be from the same torc
C.6	NCM	1949.75.50	GREY.78	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Rod/?torc/ ?bracelet			Gold/silver alloy	
C.7	NCM	1949.75	WHITE.14	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet			Gold/silver alloy	C.7–18 may be from the same torc
C.8	NCM	1949.75	WHITE.13	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet			Gold/silver alloy	C.7–18 may be from the same torc
C.9	NCM	1949.75	WHITE.50	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during Rainbird Clarke excavations, Trench 20	Wire/?torc/ ?bracelet	(?P)F		Gold/silver alloy	C.7–18 may be from the same torc
C.10	NCM	1949.75	WHITE.10	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?P)R		Gold/silver alloy	C.7–18 may be from the same torc
C.11	NCM	1949.75	WHITE.12	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet			Gold/silver alloy	C.7–18 may be from the same torc
C.12	NCM	1949.75	BLUE.31	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?P)F		Gold/silver alloy	C.7–18 may be from the same torc

Cat no.	Museum	Reg. no.	Ticket no.	Published ref.	Stead code	Ralph no.	Ex. year	Findspot	Context details	Object name	MSCC or TUB torc type	Torc terminal type	Material	Joining / related fragments?
C.13	NCM	1949.75	WHITE.11	Clarke 1954, 47, no. 11; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?P)F		Gold/silver alloy	C.7–18 may be from the same torc
C.14	NCM	1949.75	WHITE.31	Clarke 1954, 47, no. 10; Hd. C no. 13			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet		?LOOP	Gold/silver alloy	C.7–18 may be from the same torc
C.15	NCM	1949.75	WHITE.17	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet			Gold/silver alloy	C.7–18 may be from the same torc
C.16	NCM	1949.75	WHITE.16	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet			Gold/silver alloy	C.7–18 may be from the same torc
C.17	NCM	1949.75	GREY.27	Clarke 1954, 58 (cake), no. 5; Hd. C no. 15			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet		?LOOP	Gold/silver alloy	C.7–18 may be from the same torc
C.18	NCM	1949.75	WHITE.15	Clarke 1954, 47, no. 9; pl. ix; Hd. C no. 12			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet			Gold/silver alloy	C.7–18 may be from the same torc
C.19	NCM	1949.75.36	WHITE.18	Clarke 1954, 47, no. 11; pl. ix; Hd. C no. 14			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?C/P)R	?LOOP	Gold/silver alloy	
C.20	NCM	1949.75	GREY.72	Clarke 1954, 47, no. 11; pl. ix (this fragment not pictured); Hd. C no. 14			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet		?LOOP	Gold/silver alloy	
C.21	NCM	1949.75	GREY.76	Clarke 1954, 47, no. 12; Hd. C no. 16			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(??(4C))R		Gold/silver alloy	
C.22	NCM	1949.75	WHITE.23	Clarke 1954, 52, no. 1; pl xi, right; Hd. C no. 17			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(7C)T	BUFFER	Copper alloy	
C.23	NCM	1949.75	BLUE.35	Clarke 1954, 47, no. 22; Hd. C no. 19			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(6C)[3T,3R, alternating]		Copper alloy	
C.24	NCM	1949.75	BLUE.45	Clarke 1954, 47, no. 22; Hd. C no. 19			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(6C)T		Copper alloy	
C.25	NCM	1949.75.12	WHITE.38	Clarke 1954, 52, no. 2; pl xi, right; Hd. C no. 18			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(5C)T		Copper alloy	C.25–7 may be from the same torc
C.26	NCM	1949.75.54	WHITE.24	Clarke 1954, 52, no. 1; pl xi, right; Hd. C no. 17			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(5C)T	BUFFER	Copper alloy	C.25–7 may be from the same torc
C.27	NCM	1949.75	WHITE.30	Clarke 1954, 52, no. 3 (left); pl xi, right; Hd. C no. 20			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(5C)T	BUFFER	Copper alloy	C.25–7 may be from the same torc
C.28	NCM	1949.75	BLUE.37	Clarke 1954, 47, no. 22; Hd. C no. 19			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(5C)T		Copper alloy	C.28–30 may be from the same torc
C.29	NCM	1949.75	BLUE.38	Clarke 1954, 47, no. 22; Hd. C no. 19			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(5C)T		Copper alloy	C.28–30 may be from the same torc
C.30	NCM	1949.75	BLUE.36	Clarke 1954, 47, no. 22; Hd. C no. 19			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(5C)T		Copper alloy	C.28–30 may be from the same torc
C.31	NCM	1949.75.53	WHITE.39	Clarke 1954, 52, no. 3 (right); pl xi, right; Hd. C no. 20			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(3P(2P))Q	BUFFER	Copper alloy	
C.32	NCM	1949.75	WHITE.43	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	
C.33	NCM	1949.75	BLUE.80	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?P/C)T		Copper alloy	
C.34	NCM	1949.75	WHITE.40	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(?C)T		Copper alloy	
C.35	NCM	1949.75	WHITE.41	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(?C)T		Copper alloy	
C.36	NCM	1949.75	WHITE.42	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(?C)T		Copper alloy	
C.37	NCM	1949.75	WHITE.47	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	
C.38	NCM	1949.75	BLUE.79	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?P/C)Q		Copper alloy	
C.39	NCM	1949.75	WHITE.48	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
C.40	NCM	1949.75	BLUE.82	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?P/C)R		Copper alloy	
C.41	NCM	1949.75	BLUE.81	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?P/C)R		Copper alloy	
C.42	NCM	1949.75	WHITE.46	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet	(?P/C)R		Copper alloy	

Cat no.	Museum	Reg. no.	Ticket no.	Published ref.	Stead code	Ralph no.	Ex. year	Findspot	Context details	Object name	MSCC or TUB torc type	Torc terminal type	Material	Joining / related fragments?
C.43	NCM	1949.75	BLUE.83-120	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Torc/bracelet	(?C)R		Copper alloy	
C.44	NCM	1949.75	BLUE.78	Not in Clarke 1954			1948	Area 1	Hoard C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
C.45	NCM	1949.75.51	WHITE.1	Clarke 1954, 58 (cake), no. 4; pl xiii, upper; Hd. C no. 2			1948	Area 1	Hoard C; found during ploughing	Large ring			Gold/silver alloy	
C.46	NCM	1949.75.41	WHITE.2	Clarke 1954, 54, no. 1; Hd. C no. 3			1948	Area 1	Hoard C; found during ploughing	Large ring			Gold/silver alloy	
C.47	NCM	1949.75.6	WHITE.37	Clarke 1954, 56, no. 15; pl. xii; Hd. C no. 6			1948	Area 1	Hoard C; found during ploughing	Small ring			Gold/silver alloy	
C.48	NCM	1949.75	WHITE.3	Clarke 1954, 55, no. 2; Hd. C no. 4			1948	Area 1	Hoard C; found during ploughing	Small ring			Copper alloy	
C.49	NCM	1949.75	WHITE.4	Clarke 1954, 55, no. 3; Hd. C no. 5			1948	Area 1	Hoard C; found during ploughing	Small ring			Copper alloy	
C.50	NCM	1949.75	WHITE.51	Clarke 1954, 58 (cake), no. 3; pl. xiii, upper, 3; Hd. C no. 11			1948	Area 1	Hoard C; found during ploughing	Sheet			Gold/silver alloy	
C.51	NCM	1949.75.57	WHITE.7	Clarke 1954, 57, no. 5; pl xiii, lower; Hd. C no. 8			1948	Area 1	Hoard C; found during ploughing	Rivet head			Copper alloy	
C.52	NCM	1949.75.58	WHITE.8	Clarke 1954, 57, no. 3; pl xiii, lower; Hd. C no. 9			1948	Area 1	Hoard C; found during ploughing	Rivet head			Copper alloy	
C.53	NCM	1949.75.58	WHITE.9	Clarke 1954, 57, no. 3; pl xiii, lower; Hd. C no. 9			1948	Area 1	Hoard C; found during ploughing	Rivet head			Copper alloy	
C.54	NCM	1949.75.45	WHITE.6	Clarke 1954, 57, no. 2; pl xiii, lower; Hd. C no. 7			1948	Area 1	Hoard C; found during ploughing	Binding strip / fitting			Copper alloy	
C.55	NCM	1949.75	GREY.56	Clarke 1954, 57, no. 6; Hd. C no. 10			1948	Area 1	Hoard C; found during ploughing	Sheet			Copper alloy	
C.56	NCM	1949.75	WHITE.49	Clarke 1954, 57, no. 6; Hd. C no. 10			1948	Area 1	Hoard C; found during Rainbird Clarke excavations, Trench 20	Sheet			Copper alloy	
C.57	NCM	1949.75	WHITE.32	Clarke 1954, 58 (Misc.), no. 4; fig. 9; Hd. C no. 1			1948	Area 1	Hoard C; found during Rainbird Clarke excavations	Nail			Iron	
C.58	NCM	1949.75	WHITE.33	Clarke 1954, 58 (Misc.), no. 4; fig. 9; Hd. C no. 1			1948	Area 1	Hoard C; found during Rainbird Clarke excavations	Nail			Iron	
C.59	NCM	1949.75	WHITE.34	Clarke 1954, 58 (Misc.), no. 4; fig. 9; Hd. C no. 1			1948	Area 1	Hoard C; found during Rainbird Clarke excavations	Nail			Iron	
C.60	NCM	1949.75	WHITE.35	Clarke 1954, 58 (Misc.), no. 4; fig. 9; Hd. C no. 1			1948	Area 1	Hoard C; found during Rainbird Clarke excavations	Nail			Iron	
C.61	NCM	1949.75	WHITE.36	Clarke 1954, 58 (Misc.), no. 4; fig. 9; Hd. C no. 1			1948	Area 1	Hoard C; found during Rainbird Clarke excavations	Nail			Iron	
B/C.1	NCM	1949.75.49	GREY.26	Clarke 1954, 47, no. 16; pl. ix; Hd. B/C no. 26			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(?2P(2P))R	LOOP	Gold/silver alloy	
B/C.2	NCM	1949.75	GREY.28	Clarke 1954, 47, no. 18; pl. ix; Hd. B/C no. 28			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(?2P(2P))R	LOOP	Gold/silver alloy	
B/C.3	NCM	1949.75	GREY.70	Clarke 1954, 48, no. 47; pl ix; Hd. B/C no. 53			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2P)R		Gold/silver alloy	B/C.3 and B/C.4 join
B/C.4	NCM	1949.75	GREY.69	Clarke 1954, 48, no. 47; pl ix; Hd. B/C no. 53			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2P)R		Gold/silver alloy	B/C.3 and B/C.4 join
B/C.5	NCM	1949.75.29	GREY.66	Clarke 1954, 48, no. 44; pl ix; Hd. B/C no. 50			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2PZ)Q	LOOP	Gold/silver alloy	
B/C.6	NCM	1949.75	GREY.73	Clarke 1954, 47, no. 17; pl. ix; Hd. B/C no. 27			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet		?LOOP	Gold/silver alloy	
B/C.7	NCM	1949.75	GREY.91	Clarke 1954, 48, no. 36; pl. ix; Hd. B/C no. 42			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet		?LOOP	Gold/silver alloy	B/C.7 and B/C.8 may be from the same loop terminal
B/C.8	NCM	1949.75	GREY.97	Clarke 1954, 48, no. 36; pl. ix; Hd. B/C no. 42			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet		?LOOP	Gold/silver alloy	B/C.7 and B/C.8 may be from the same loop terminal
B/C.9	NCM	1949.75.9	GREY.101	Clarke 1954, 48, no. 33; pl. viii; Hd. B/C no. 39			1948	Area 1	Hoard B/C; found during ploughing	Torc	(2PZ)R	LOOP	Copper alloy	
B/C.10	NCM	1949.75.3	GREY.38	Clarke 1954, 47, no. 31; pl viii; Hd. B/C no. 37			1948	Area 1	Hoard B/C; found during ploughing	Torc	(2PZ)R	LOOP	Copper alloy	
B/C.11	NCM	1949.75.7	GREY.102	Clarke 1954, 48, no. 32; pl. viii; Hd. B/C no. 38			1948	Area 1	Hoard B/C; found during ploughing	Torc	(2PZ)F	LOOP	Copper alloy	
B/C.12	NCM	1949.75.4	GREY.37	Clarke 1954, 47, no. 30; pl. viii; Hd. B/C no. 36			1948	Area 1	Hoard B/C; found during ploughing	Bracelet	(2PZ)F	LOOP	Copper alloy	

Cat no.	Museum	Reg. no.	Ticket no.	Published ref.	Stead code	Ralph no.	Ex. year	Findspot	Context details	Object name	MSCC or TUB torc type	Torc terminal type	Material	Joining / related fragments?
B/C.13	NCM	1949.75	GREY.62	Clarke 1954, 48, no. 41; pl ix; Hd. B/C no. 47			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2P)Q	LOOP	Copper alloy	
B/C.14	NCM	1949.75	GREY.67	Clarke 1954, 48, no. 45; pl ix; Hd. B/C no. 51			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2PZ)Q	LOOP	Copper alloy	B/C.14 and B/C.15 may be from the same torc
B/C.15	NCM	1949.75	GREY.71	Clarke 1954, 48, no. 48; pl ix; Hd. B/C no. 54			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2PZ)Q		Copper alloy	B/C.14 and B/C.15 may be from the same torc
B/C.16	NCM	1949.75.20	WHITE.5	Clarke 1954, 48, no. 38; pl ix; Hd. B/C no. 44			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet		LOOP	Copper alloy	
B/C.17	NCM	1949.75	GREY.89	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet	(?2P)R		Copper alloy	
B/C.18	NCM	1949.75	GREY.79	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet		?LOOP	Copper alloy	
B/C.19	NCM	1949.75	GREY.41	Clarke 1954, 48, no. 35; pl ix; Hd. B/C no. 41			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet		LOOP	Copper alloy	B/C.19-B/C.22 may be part of the same torc or bracelet
B/C.20	NCM	1949.75	GREY.45	Clarke 1954, 48, no. 39; pl ix; Hd. B/C no. 45			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet		?LOOP	Copper alloy	B/C.19-B/C.22 may be part of the same torc or bracelet
B/C.21	NCM	1949.75	GREY.64	Clarke 1954, 48, no. 40; pl ix (top left, mis-labelled in the plate as no. 42); Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet		?LOOP	Copper alloy	B/C.19-B/C.22 may be part of the same torc or bracelet
B/C.22	NCM	1949.75.20	GREY.44	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet		LOOP	Copper alloy	B/C.19-B/C.22 may be part of the same torc or bracelet
B/C.23	NCM	1949.75.47	GREY.33	Not in Clarke 1954			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2P)R		Copper alloy	
B/C.24	NCM	1949.75.27	GREY.65	Clarke 1954, 48, no. 43; pl viii; Hd. B/C no. 49			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2PZ)Q	LOOP	Copper alloy	
B/C.25	NCM	1949.75.25	GREY.43	Clarke 1954, 48, no. 37; pl ix; Hd. B/C no. 43			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet		LOOP	Copper alloy	
B/C.26	NCM	1949.75	GREY.46	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet		?LOOP	Copper alloy	B/C.26–31 may be from the same torc or bracelet
B/C.27	NCM	1949.75	GREY.47	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	B/C.26–31 may be from the same torc or bracelet
B/C.28	NCM	1949.75	GREY.49	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	B/C.26-30 may be from the same torc or bracelet
B/C.29	NCM	1949.75	GREY.50	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	B/C.26–31 may be from the same torc or bracelet
B/C.30	NCM	1949.75	GREY.51	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	B/C.26–31 may be from the same torc or bracelet
B/C.31	NCM	1949.75	GREY.52	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	B/C.26–31 may be from the same torc or bracelet
B/C.32	NCM	1949.75	GREY.92	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
B/C.33	NCM	1949.75	GREY.93	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
B/C.34	NCM	1949.75	GREY.95	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
B/C.35	NCM	1949.75.28	GREY.63	Clarke 1954, 48, no. 42; pl ix; Hd. B/C no. 48			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2PZ)R	LOOP	Copper alloy	
B/C.36	NCM	1949.75	GREY.68	Clarke 1954, 48, no. 46; pl ix; Hd. B/C no. 52			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2PZ)F	LOOP	Copper alloy	

Cat no.	Museum	Reg. no.	Ticket no.	Published ref.	Stead code	Ralph no.	Ex. year	Findspot	Context details	Object name	MSCC or TUB torc type	Torc terminal type	Material	Joining / related fragments?
B/C.37	NCM	1949.75.22	GREY.104	Clarke 1954, 48, no. 34; pl. ix; Hd. B/C no. 40			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet		LOOP	Copper alloy	
B/C.38	NCM	1949.75	GREY.94	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
B/C.39	NCM	1949.75	GREY.98	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
B/C.40	NCM	1949.75	GREY.99	Clarke 1954, 48, no. 40; pl ix; Hd. B/C no. 46			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet			Copper alloy	
B/C.41	NCM	1949.75	WHITE.19-22; WHITE.25-29	Clarke 1954, 47, no. 29; pl. ix, upper right; Hd. B/C no. 35			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	
B/C.42	NCM	1949.75.37	BLUE.33	Clarke 1954, 47, no. 26; Hd. B/C no. 32			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(3PZ)R		Copper alloy	B/C.42–3 may be from the same torc
B/C.43	NCM	1949.75	GREY.31	Clarke 1954, 47, no. 26; Hd. B/C no. 32			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(3PZ)R		Copper alloy	B/C.42–3 may be from the same torc
B/C.44	NCM	1949.75.37	BLUE.34	Clarke 1954, 47, no. 26; Hd. B/C no. 32			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(3P)R		Copper alloy	B/C.44–5 may be from the same torc
B/C.45	NCM	1949.75	GREY.32	Clarke 1954, 47, no. 26; Hd. B/C no. 32			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(3P)R		Copper alloy	B/C.44–5 may be from the same torc
B/C.46	NCM	1949.75	BLUE.60-77	Not in Clarke 1954			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet	(?P/C)R		Copper alloy	
B/C.47	NCM	1949.75.11	GREY.103	Clarke 1954, 47, no. 23; pl. viii; pl. ix; Hd. B/C no. 29			1948	Area 1	Hoard B/C; found during ploughing	Torc	(2P(2P))R	RING	Copper alloy	B/C.47–8 are from the same torc
B/C.48	NCM	1949.75.11	GREY.29	Clarke 1954, 47, no. 23; pl. viii; pl. ix; Hd. B/C no. 29			1948	Area 1	Hoard B/C; found during ploughing	Torc	(2P(2P))R	RING	Copper alloy	B/C.47–8 are from the same torc
B/C.49	NCM	1949.75	GREY.35	Clarke 1954, 47, no. 25; Hd. B/C no. 31			1948	Area 1	Hoard B/C; found during ploughing	Torc	(2P(2P))R		Copper alloy	B/C.49 may be from the same torc as B/C.47-8
B/C.50	NCM	1949.75.14	GREY.30	Clarke 1954, 47, no. 24; pl. viii; Hd. B/C no. 30			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2P(2P))R	LOOP	Copper alloy	B/C. 50–3 may be from the same torc
B/C.51	NCM	1949.75	GREY.34	Clarke 1954, 47, no. 25; Hd. B/C no. 31			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2P(2P))R	LOOP	Copper alloy	B/C. 50–3 may be from the same torc
B/C.52	NCM	1949.75.31	GREY.54	Clarke 1954, 47, no. 25; Hd. B/C no. 31			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2P(2P))R		Copper alloy	B/C. 50–3 may be from the same torc
B/C.53	NCM	1949.75	BLUE.57-9	Clarke 1954, 47, no. 25; Hd. B/C no. 31			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	((?P)2P)R		Copper alloy	B/C. 50–3 may be from the same torc
B/C.54	NCM	1949.75.12	GREY.36	Clarke 1954, 47, no. 27; pl. ix, lower left (erroneously labelled as 'no. 29'); Hd. B/C no. 33			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(?3C(2P))R	LOOP	Copper alloy	B/C.54–5 join
B/C.55	NCM	1949.75	GREY.77	Clarke 1954, 47, no. 27; pl. ix, lower left (erroneously labelled as 'no. 29'); Hd. B/C no. 33			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(?3C(2P))R	LOOP	Copper alloy	B/C.54–5 join
B/C.56	NCM	1949.75	BLUE.50-56	Clarke 1954, 47, no. 25; Hd. B/C no. 31			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(?C(2P))R		Copper alloy	
B/C.57	NCM	1949.75	BLUE.47	Clarke 1954, 47, no. 28; Hd. B/C no. 34			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(2P)R		Copper alloy	
B/C.58	NCM	1949.75	WHITE.44	Clarke 1954, 47, no. 28; Hd. B/C no. 34			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(?P(2P))R		Copper alloy	
B/C.59	NCM	1949.75	WHITE.45	Clarke 1954, 47, no. 28; Hd. B/C no. 34			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(?C([1+1x2P]P))R		Copper alloy	
B/C.60	NCM	1949.75.24	GREY.55	Clarke 1954, 47, no. 25; Hd. B/C no. 31			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(?C(2P))R		Copper alloy	
B/C.61	NCM	1949.75	BLUE.49	Clarke 1954, 47, no. 25; Hd. B/C no. 31			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet		?LOOP	Copper alloy	
B/C.62	NCM	1949.75	BLUE.26	Clarke 1954, 47, no. 25; Hd. B/C no. 31			1948	Area 1	Hoard B/C; found during ploughing	Torc/bracelet	(?C(3P(2P)))R		Copper alloy	
B/C.63	NCM	1949.75	GREY.53	Not in Clarke 1954			1948	Area 1	Hoard B/C; found during ploughing	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	
B/C.64	NCM	1949.75	GREY.11	Clarke 1954, 55, no. 4; Hd. B/C no. 10			1948	Area 1	Hoard B/C; found during ploughing	Small ring			Gold/silver alloy	

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B/C.65	NCM	1949.75.23	GREY.1	Clarke 1954, 54, no. 2; fig. 7; Hd. B/C no. 1			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.66	NCM	1949.75.17	GREY.4	Clarke 1954, 54, no. 4; fig. 7; Hd. B/C no. 3			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.67	NCM	1949.75.21	GREY.3	Clarke 1954, 54, no. 3; Hd. B/C no. 2			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.68	NCM	1949.75.10	GREY.39	Clarke 1954, 54, no. 5; fig. 7; Hd. B/C no. 4			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.69	NCM	1949.75.19	GREY.2	Clarke 1954, 54, no. 6; Hd. B/C no. 5			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.70	NCM	1949.75.48	GREY.8	Clarke 1954, 54, no. 9; Hd. B/C no. 8			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.71	NCM	1949.75.8	GREY.5	Clarke 1954, 54, no. 7; fig. 7; Hd. B/C no. 6			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.72	NCM	1949.75	GREY.7	Clarke 1954, 54, no. 8; Hd. B/C no. 7			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.73	NCM	1949.75	GREY.75	Clarke 1954, 54, no. 10; Hd. B/C no. 9			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.74	NCM	1949.75	GREY.87	Clarke 1954, 54, no. 10; Hd. B/C no. 9			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.75	NCM	1949.75	GREY.10	Clarke 1954, 54, no. 10; Hd. B/C no. 9			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.76	NCM	1949.75	GREY.9	Clarke 1954, 54, no. 10; Hd. B/C no. 9			1948	Area 1	Hoard B/C; found during ploughing	Large ring			Copper alloy	
B/C.77	NCM	1949.75.11	GREY.12	Clarke 1954, 55, no. 5; Hd. B/C no. 11			1948	Area 1	Hoard B/C; found during ploughing	Small ring			Copper alloy	
B/C.78	NCM	1949.75.12	GREY.13	Clarke 1954, 55, no. 6; Hd. B/C no. 12			1948	Area 1	Hoard B/C; found during ploughing	Small ring			Copper alloy	
B/C.79	NCM	1949.75.14	GREY.15	Clarke 1954, 55, no. 8; Hd. B/C no. 14			1948	Area 1	Hoard B/C; found during ploughing	Small ring			Copper alloy	
B/C.80	NCM	1949.75.16	GREY.17	Clarke 1954, 55, no. 10; Hd. B/C no. 16			1948	Area 1	Hoard B/C; found during ploughing	Small ring			Copper alloy	
B/C.81	NCM	1949.75.17	GREY.18	Clarke 1954, 56, no. 13; Hd. B/C no. 17			1948	Area 1	Hoard B/C; found during ploughing	Small ring			Copper alloy	
B/C.82	NCM	1949.75.13	GREY.14	Clarke 1954, 55, no. 7; Hd. B/C no. 13			1948	Area 1	Hoard B/C; found during ploughing	Small ring			Copper alloy	
B/C.83	NCM	1949.75.15	GREY.16	Clarke 1954, 55, no. 9 (pl. xii); Hd. B/C no. 15			1948	Area 1	Hoard B/C; found during ploughing	Small ring			Copper alloy	
B/C.84	NCM	1949.75.193	GREY.20	Clarke 1954, 58 (cake), no. 7; pl xiii, upper; Hd. B/C no. 19			1948	Area 1	Hoard B/C; found during ploughing	Triangular ingot			Gold/silver alloy	
B/C.85	NCM	1949.75.52	GREY.19	Clarke 1954, 58 (cake), no. 6; pl xiii, upper; Hd. B/C no. 18			1948	Area 1	Hoard B/C; found during ploughing	Linear ingot			Gold/silver alloy	
B/C.86	NCM	1949.75	GREY.21	Clarke 1954, 58 (cake), no. 8; pl xiii, upper; Hd. B/C no. 20			1948	Area 1	Hoard B/C; found during ploughing	Linear ingot			Gold/silver alloy	
B/C.87	NCM	1949.75.49	GREY.22	Clarke 1954, 58 (cake), no. 9; pl xiii, upper; Hd. B/C no. 21			1948	Area 1	Hoard B/C; found during ploughing	Amorphous lump			Gold/silver alloy	
B/C.88	NCM	1949.75.45	GREY.23	Clarke 1954, 57, no. 4; pl. xiii, lower; fig. 8; Hd. B/C no. 22.			1948	Area 1	Hoard B/C; found during ploughing	Scale pan			Copper alloy	
B/C.89	NCM	1949.75.56	GREY.24	Clarke 1954, 57, no. 1; pl xiii, lower; Hd. B/C no. 23. Stead (1991c, 24, 30, Type E no. 10)			1948	Area 1	Hoard B/C; found during ploughing	Binding strip			Copper alloy	
B/C.90	NCM	1949.75.44	GREY.25	Clarke 1954, 58 (Misc.), no.2; pl xiii, lower, Misc.2; Hd. B/C no. 25			1948	Area 1	Hoard B/C; found during ploughing	Fitting			Copper alloy	
B/C.91	NCM	1949.75	GREY.61	Clarke 1954, 57, no. 7; Hd. B/C no. 24			1948	Area 1	Hoard B/C; found during ploughing	Sheet			Copper alloy	
B/C.92	NCM	1949.75	GREY.57	Clarke 1954, 57, no. 7; Hd. B/C no. 24			1948	Area 1	Hoard B/C; found during ploughing	Sheet			Copper alloy	
B/C.93	NCM	1949.75	GREY.58	Clarke 1954, 57, no. 7; Hd. B/C no. 24			1948	Area 1	Hoard B/C; found during ploughing	Sheet			Copper alloy	
B/C.94	NCM	1949.75	GREY.59	Clarke 1954, 57, no. 7; Hd. B/C no. 24			1948	Area 1	Hoard B/C; found during ploughing	Sheet			Copper alloy	

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B/C.95	NCM	1949.75	GREY.60	Clarke 1954, 57, no. 7; Hd. B/C no. 24			1948	Area 1	Hoard B/C; found during ploughing	Binding strip			Copper alloy	
B/C.96	NCM	1949.75	GREY.105	Not in Clarke 1954			1948	Area 1	Hoard B/C; found during ploughing	Metalworking waste			Slag	
D.1a	BM	1951,0402.1		Clarke 1954, 47, no. 13; pl. x			1950	Area 1	Hoard D; found during ploughing in 1950	Torc	(2P)R	LOOP	Gold/silver alloy	
D.1b	BM	1951,0402.1		Clarke 1954, 56, no. 16; pl. x			1950	Area 1	Hoard D; found during ploughing in 1950	Large ring			Gold/silver alloy	
E.1a	BM	1951,0402.2					1950	Area 4	Hoard E; found during ploughing in 1950	Torc	(8C(8C))R	TORUS	Gold/silver alloy	
E.1b	BM	1951,0402.3					1950	Area 4	Hoard E; found during ploughing in 1950	Torc	(2P)R	BUFFER	Gold/silver alloy	
E.1c	BM	1951,0402.4					1950	Area 4	Hoard E; found during ploughing in 1950	bracelet			Gold/silver alloy	
F.1a	BM	1991,0501.1				1a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.1b	BM	1991,0501.2				1b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.1c	BM	1991,0501.5				1c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 1)	BUFFER	Gold/silver alloy	
F.1d	BM	1991,0501.3				1e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 1)	BUFFER	Gold/silver alloy	
F.1e	BM	1991,0501.4				1d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R/ 3P(2P))R		Gold/silver alloy	
F.2a	BM	1991,0501.6				2a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 1)		Gold/silver alloy	
F.2b	BM	1991,0501.6				2a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.2c	BM	1991,0501.7				2b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	?TUBULAR		Gold/silver alloy	
F.2d	BM	1991,0501.8				2c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P)R		Gold/silver alloy	
F.2e	BM	1991,0501.9				2d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	
F.2f	BM	1991,0501.10				2e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
F.2g	BM	1991,0501.11				2f	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 3)	BUFFER	Gold/silver alloy	
F.2h	BM	1991,0501.13				2g	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 3)	BUFFER	Gold/silver alloy	
F.2i	BM	1991,0501.12				2h	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.3a	BM	1991,0501.120				3a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.3b	BM	1991,0501.121				3b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
F.3c	BM	1991,0501.122				3c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	RING	Gold/silver alloy	
F.3d	BM	1991,0702.10				3d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Copper alloy	
F.3e	BM	1991,0501.123				3e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4PZ)R		Gold/silver alloy	
F.3f	BM	1991,0702.11				3f	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	
F.3g	BM	1991,0702.12				3g	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)?Q	LOOP	Copper alloy	
F.3h	BM	1991,0501.124				3h	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2PZ)Q	LOOP	Gold/silver alloy	Probably part of the same object as F.3i, with which it is interlinked.

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F.3i	BM	1991,0501.124				3h	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2PZ)Q		Gold/silver alloy	Probably part of the same object as F.3h, with which it is interlinked.
F.4a	BM	1991,0501.46				53a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C)T	CAGE	Gold/silver alloy	
F.4b	BM	1991,0501.47				53b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(4C)T	RING	Gold/silver alloy	
F.4c	BM	1991,0501.48				53c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP/RING	Gold/silver alloy	
F.4d	BM	1991,0501.49				53d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2PZ)R	LOOP	Gold/silver alloy	
F.4e	BM	1991,0501.50				53e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P(2P))R	LOOP	Gold/silver alloy	
F.4f	BM	1991,0501.51				53f	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 1)		Gold/silver alloy	
F.5a	BM	1991,0501.53				55a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.5b	BM	1991,0501.54				55b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.5c	BM	1991,0501.55				55c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P)R	RING	Gold/silver alloy	
F.5d	BM	1991,0501.56				55d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P(2P))R		Gold/silver alloy	
F.5e	BM	1991,0501.57				55e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.5f	BM	1991,0501.58				55f	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.5g	BM	1991,0501.59				55g	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 1)		Gold/silver alloy	
F.6a	BM	1991,0501.103				116a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring; torc	(4C)T		Gold/silver alloy	
F.6b	BM	1991,0501.104				116b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4)	BUFFER	Gold/silver alloy	
F.6c	BM	1991,0501.105				116c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.6d	BM	1991,0501.106				116d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.6e	BM	1991,0501.107				116e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.6f	BM	1991,0702.2				116f	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(5C)R		Gold/silver alloy	
F.6g	BM	1991,0501.108				116g	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.7a	BM	1991,0702.3				117a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.7b	BM	1991,0501.109				117b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	?(2P)T	?LOOP	Gold/silver alloy	
F.7c	BM	1991,0702.4				117c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
F.7d	BM	1991,0501.110				117d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2PZ))R	RING	Gold/silver alloy	
F.7e	BM	1991,0501.111				117e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)T	?CAGE	Gold/silver alloy	
F.7f	BM	1991,0501.112				117f	1990	Area 4	Hoard F pit; metal-detected find August 1990	Bracelet	(2P)R	HOOK/LOOP	Gold/silver alloy	
F.7g	BM	1991,0501.113				117g	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P)2R+1T	RING	Gold/silver alloy	
F.8a	BM	1991,0702.62				262a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(3P))R	RING	Gold/silver alloy	

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F.8b	BM	1991,0702.63				262b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2PZ)R	LOOP	Copper alloy	
F.8c	BM	1991,0702.64				262c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/strip			Copper alloy	
F.8d	BM	1991,0702.65				262c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/strip			Copper alloy	
F.8e	BM	1991,0702.66				262c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/strip			Copper alloy	
F.9a	BM	1991,0501.125				4a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)T	RING	Gold/silver alloy	
F.9b	BM	1991,0501.126				4b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
F.9c	BM	1991,0501.127				4c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)T		Gold/silver alloy	
F.9d	BM	1991,0501.128				4d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.10a	BM	1991,0501.40				46a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)T	RING/CAGE	Gold/silver alloy	
F.10b	BM	1991,0501.41				46b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.11a	BM	1991,0501.133				22a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2PZ)R		Gold/silver alloy	Probably from the same object as interlinked strand F.11b
F.11b	BM	1991,0501.133				22b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2PZ)R		Gold/silver alloy	Probably from the same object as interlinked strand F.11a
F.12a	BM	1991,0702.51				205a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.12b	BM	1991,0702.50				205b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.13a	BM	1991,0501.182				155a/b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)T		Copper alloy	
F.13b	BM	1991,0501.182				155c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.14a	BM	1991,0501.209				214a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
F.14b	BM	1991,0702.9				214b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Copper alloy	
F.15a	BM	1991,0702.137				257a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)T	RING	Copper alloy	
F.15b	BM	1991,0702.138				257b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(5C)T		Copper alloy	
F.16a	BM	1991,0702.226				450a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Copper alloy	Probably from the same object as F.16b, with which it is interlinked
F.16b	BM	1991,0702.227				450b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	Probably from the same object as F.16a, with which it is interlinked
F.17a	BM	1991,0501.216				286a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)Q		Gold/silver alloy	
F.17b	BM	1991,0702.8				286b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.17c	BM	1991,0501.217				286c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet		LOOP	Gold/silver alloy	
F.18a	BM	1991,0501.62				59a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.18b	BM	1991,0501.63				59b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.18c	BM	1991,0501.64				59c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	

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F.18d	BM	1991,0501.65				59d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.18e	BM	1991,0501.66				59e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.18f	BM	1991,0501.67				59f	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.18g	BM	1991,0501.68				59g	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.18h	BM	1991,0501.69				59h	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
F.18i	BM	1991,0501.69.a				59h	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip			Gold/silver alloy	
F.18j	BM	1991,0501.70				59i	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.18k	BM	1991,0501.71				59j	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.18l	BM	1991,0501.72				59k	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.19a	BM	1991,0501.160				96a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.19b	BM	1991,0501.161				96b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	
F.20a	BM	1991,0702.29				128a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.20b	BM	1991,0702.30				128b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.21a	BM	1991,0501.206				204a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.21b	BM	1991,0501.207				204b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Gold/silver alloy	
F.22a	BM	1991,0501.148				82a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.22b	BM	1991,0501.149				82b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring/?torc		?LOOP	Gold/silver alloy	
F.23a	BM	1991,0702.42				207a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.23b	BM	1991,0702.43				207b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	
F.24a	BM	1991,0501.130				20b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
F.24b	BM	1991,0501.131				20a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.25a	BM	1991,0501.14.a				5a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.25b	BM	1991,0501.14.b				5b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.25c	BM	1991,0501.14.c				5c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.25d	BM	1991,0501.14.d				5d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.25e	BM	1991,0501.14.e				5e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.25f	BM	1991,0501.14.f				5f	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.25g	BM	1991,0501.14.g				5g	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.25h	BM	1991,0501.14.h				5h	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.25i	BM	1991,0501.14.i				5i	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	

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F.25j	BM	1991,0501.14.j				5j	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.26a	BM	1991,0501.140				58a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.26b	BM	1991,0501.141				58b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.26c	BM	1991,0501.142				58c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.26d	BM	1991,0501.143				58d	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.26e	BM	1991,0702.7				58e	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.27a	BM	1991,0501.139				51a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.27b	BM	1991,0702.22				51b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.28a	BM	1991,0501.167				129a	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.28b	BM	1991,0501.168				129b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.29a	BM	1991,0501.135				25	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	Perhaps from the same torc as F.56
F.29b	BM	1991,0501.135				25	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.29c	BM	1991,0501.135				25	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.30a	BM	1991,0501.90				101	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4)	BUFFER	Gold/silver alloy	
F.30b	BM	1991,0501.90				101	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc			Gold/silver alloy	
F.31a	BM	1991,0501.28				33	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 5)	BUFFER	Gold/silver alloy	
F.31b	BM	1991,0501.28.a					1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 1)		Gold/silver alloy	
F.32	BM	1991,0501.136				26	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc; torc / bracelet	TUBULAR (TYPE 4/5); (2P)R		Gold/silver alloy	
F.33	BM	1991,0501.165				102	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc; strip/?small/ large ring; wire	TUBULAR (TYPE 1)		Gold/silver alloy	
F.34	BM	1991,0501.16				7	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet; wire; sheet	(6C(2P))R		Gold/silver alloy	
F.35	BM	1991,0501.21				13	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc; wire	TUBULAR (TYPE 3)	BUFFER	Gold/silver alloy	
F.36	BM	1991,0501.23				18	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet; ?wire	(2P)TZ	RING	Gold/silver alloy	
F.37	BM	1991,0501.24				19	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet; sheet	(2P)R		Gold/silver alloy	
F.38	BM	1991,0501.43				48	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet; ?wire	(4C)T	CAGE	Gold/silver alloy	
F.39	BM	1991,0501.44				50	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc; wire	(3P)T	LOOP	Gold/silver alloy	
F.40	BM	1991,0501.52				54	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet; wire	(2P)R	RING	Gold/silver alloy	
F.41	BM	1991,0501.78				66	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(3P)R	?BUFFER	Gold/silver alloy	
F.42	BM	1991,0501.96				108	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4); (2P)Q	BUFFER	Gold/silver alloy	
F.43	BM	1991,0501.29				34	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet; wire; sheet	TUBULAR (TYPE 5); (2P)T	BUFFER; RING	Gold/silver alloy	
F.44	BM	1991,0407.46			SN/AJ		1990	Area 4	Hoard F pit; excavated find, at edge of hoard pit.	Torc/bracelet	(2PZ)R		Copper alloy	
F.45	BM	1991,0501.91				103	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4)	BUFFER	Gold/silver alloy	

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F.46	BM	1991,0501.98				110	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4)	BUFFER	Gold/silver alloy	
F.47	BM	1991,0501.20				12	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 3)	BUFFER	Gold/silver alloy	Possibly the pair to F.48
F.48	BM	1991,0501.27				32	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 3)	BUFFER	Gold/silver alloy	Possibly the pair to F.47
F.49	BM	1991,0501.138				35	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR	?BUFFER	Gold/silver alloy	
F.50	BM	1991,0501.208				209	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	
F.51	BM	1991,0501.34				40	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	
F.52	BM	1991,0501.76				64	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	
F.53	BM	1991,0501.118				307	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	Coins cat nos 174–8 found inside
F.54	BM	1991,0501.31				37	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	Similar to F.55, though not a joining piece
F.55	BM	1991,0501.32				38	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	Similar to F.54, though not a joining piece
F.56	BM	1991,0501.97				109	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	Perhaps part of the same object as F.29a
F.57	BM	1991,0501.119				30	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 1)	BUFFER	Gold/silver alloy	
F.58	BM	1991,0501.25				29	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 1)	BUFFER	Gold/silver alloy	
F.59	BM	1991,0501.77				65	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 1)	BUFFER	Gold/silver alloy	
F.60	BM	1991,0501.26				31	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 3)	BUFFER	Gold/silver alloy	
F.61	BM	1991,0501.164				100	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 4)	BUFFER	Gold/silver alloy	
F.62	BM	1991,0501.30				36	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc; wire	TUBULAR (?TYPE 3)	?BUFFER	Gold/silver alloy	
F.63	BM	1991,0501.33				39	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 2)	BUFFER	Gold/silver alloy	F.63–6 may be from the same torc
F.64	BM	1991,0501.35				41	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 2)	?BUFFER	Gold/silver alloy; iron	F.63–6 may be from the same torc
F.65	BM	1991,0501.36				42	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 2)	?BUFFER	Gold/silver alloy; iron	F.63–6 may be from the same torc
F.66	BM	1991,0501.134				24	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	TUBULAR (TYPE 2)		Gold/silver alloy; iron	F.63–6 may be from the same torc
F.67	BM	1991,0501.132				21	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip/?torc			Gold/silver alloy	
F.68	BM	1991,0702.46				208	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc		RING	Gold/silver alloy	
F.69	BM	1991,0702.47				308	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet		?LOOP	Gold/silver alloy	
F.70	BM	1991,0501.212				218	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet		LOOP	Gold/silver alloy	
F.71	BM	1991,0501.183				156	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc		BUFFER	Gold/silver alloy	
F.72	BM	1991,0501.45				52	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc		TORUS	Gold/silver alloy	
F.73	BM	1991,0501.89				77	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
F.74	BM	1991,0501.151				84	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	?(2P)R		Gold/silver alloy	
F.75	BM	1991,0501.173				134	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P)F		Gold/silver alloy	F.75 and F.76 may be part of the same torc

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F.76	BM	1991,0501.174				135	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P)F		Gold/silver alloy	F.75 and F.76 may be part of the same torc
F.77	BM	1991,0501.210				215	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P)F		Gold/silver alloy	
F.78	BM	1991,0501.37				43	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P)F	LOOP	Gold/silver alloy	
F.79	BM	1991,0501.152				85	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(?P(2P))R		Gold/silver alloy	
F.80	BM	1991,0501.38				44	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P)R	LOOP	Gold/silver alloy	
F.81	BM	1991,0501.147				81	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.82	BM	1991,0501.155				88	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	RING	Gold/silver alloy	
F.83	BM	1991,0501.159				95	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.84	BM	1991,0501.158				94	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.85	BM	1991,0501.95				107	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P)R	?CAGE	Gold/silver alloy	
F.86	BM	1991,0501.42				47	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4C)T	CAGE	Gold/silver alloy	
F.87	BM	1991,0501.93				105	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P)R	LOOP	Gold/silver alloy	
F.88	BM	1991,0501.22				17	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4C)R		Gold/silver alloy	
F.89	BM	1991,0501.101				113	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)R	LOOP	Gold/silver alloy	
F.90	BM	1991,0501.157				91	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)T	LOOP	Gold/silver alloy	
F.91	BM	1991,0501.100				112	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)T	LOOP	Gold/silver alloy	
F.92	BM	1991,0501.82				70	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C)R		Gold/silver alloy	F.92 and F.93 join
F.93	BM	1991,0501.83				71	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C)R		Gold/silver alloy	F.92 and F.93 join
F.94	BM	1991,0501.17				8	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(5C)T		Gold/silver alloy	
F.95	BM	1991,0501.18				9	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)T	CAGE	Gold/silver alloy	
F.96	BM	1991,0501.84				72	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(8C)R		Gold/silver alloy	F.96 and F.97 may be part of the same torc
F.97	BM	1991,0501.85				73	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(8C)R		Gold/silver alloy	F.96 and F.97 may be part of the same torc
F.98	BM	1991,0501.15				6	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(8C)T	CAGE	Gold/silver alloy	
F.99	BM	1991,0501.137				27	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(9C)R		Gold/silver alloy	F.99–104 may be part of the same torc
F.100	BM	1991,0501.185				164	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(9C)R		Gold/silver alloy	F.99–104 may be part of the same torc
F.101	BM	1991,0501.186				165	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(9C)R		Gold/silver alloy	F.99–104 may be part of the same torc
F.102	BM	1991,0501.187				166	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(9C)R		Gold/silver alloy	F.99–104 may be part of the same torc
F.103	BM	1991,0501.215				275	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(9C)R		Gold/silver alloy	F.99–104 may be part of the same torc
F.104	BM	1991,0702.182				360	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(9C)R		Gold/silver alloy	F.99–104 may be part of the same torc
F.105	BM	1991,0501.211				217	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?P(3PZ))R	RING	Gold/silver alloy	

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F.106	BM	1991,0501.19				10	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(?C(2P))R	BUFFER	Gold/silver alloy	
F.107	BM	1991,0501.92				104	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R	RING	Gold/silver alloy	
F.108	BM	1991,0501.154				87	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Gold/silver alloy	
F.109	BM	1991,0702.48				324	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2PZ(2P))R		Gold/silver alloy	F.109–11 may be part of the same torc
F.110	BM	1991,0501.175				136	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2PZ(2P))R		Gold/silver alloy	F.109–11 may be part of the same torc
F.111	BM	1991,0501.176				137	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2PZ(2P))R		Gold/silver alloy	F.109–11 may be part of the same torc
F.112	BM	1991,0702.59				267	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2PZ(4P))R		Gold/silver alloy	F.112 and F.113 may be part of the same torc
F.113	BM	1991,0501.184				157	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2PZ(4P))R		Gold/silver alloy	F.112 and F.113 may be part of the same torc
F.114	BM	1991,0501.39				45	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3C(2P))R		Gold/silver alloy	
F.115	BM	1991,0501.163				98	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(3P(6C))R	BUFFER	Gold/silver alloy	
F.116	BM	1991,0501.145				79	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(4CZ(2P))R		Gold/silver alloy	
F.117	BM	1991,0501.94				106	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(4P(2P))R	RING	Gold/silver alloy	
F.118	BM	1991,0501.129				16	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C(2PZ))R	BUFFER	Gold/silver alloy	
F.119	BM	1991,0501.81				69	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C(3P(2P)))R	REEL	Gold/silver alloy	F.119 and F.120 join
F.120	BM	1991,0501.80				68	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C(3P(2P)))R	REEL	Gold/silver alloy	F.119 and F.120 join
F.121	BM	1991,0501.146				80	1990	Area 4	Hoard F pit; metal-detected find August 1990	Bracelet	(2P)R	LOOP	Gold/silver alloy	
F.122	BM	1991,0501.153				86	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?3P)T		Gold/silver alloy	
F.123	BM	1991,0501.79				67	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.124	BM	1991,0501.194				176	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.125	BM	1991,0702.70				269, 416, 417, 418, 420, 421	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.126	BM	1991,0702.72				427	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.127	BM	1991,0702.69				260	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.128	BM	1991,0702.204				383	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.129	BM	1991,0702.221				407	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.130	BM	1991,0702.68				259	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.131	BM	1991,0702.219				399	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.132	BM	1991,0501.180				146	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	May be part of the same object as F.133

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F.133	BM	1991,0501.181				147	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	May be part of the same object as F.132
F.134	BM	1991,0702.205				384	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.135	BM	1991,0501.222				380	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?P(2P))R		Gold/silver alloy	
F.136	BM	1991,0702.220				400	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
F.137	BM	1991,0702.212				392	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.138	BM	1991,0501.177				138	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Gold/silver alloy	
F.139	BM	1991,0501.178				139	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Gold/silver alloy	
F.140	BM	1991,0501.102				115	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R	?CAGE/ ?LOOP	Gold/silver alloy	
F.141	BM	1991,0702.71				419	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2PZ)R		Gold/silver alloy	
F.142	BM	1991,0501.179				141	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?P(2PZ))R		Gold/silver alloy	
F.143	BM	1991,0702.67				266, 271	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(3P))R		Gold/silver alloy	
F.144	BM	1991,0501.188				168	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P)2T+1R		Gold/silver alloy	
F.145	BM	1991,0501.190				170	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)T		Gold/silver alloy	
F.146	BM	1991,0501.214				240	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)3R+3T	BUFFER	Gold/silver alloy	
F.147	BM	1991,0501.221				353	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)R		Gold/silver alloy	F.147 and F.148 may be part of the same object
F.148	BM	1991,0501.86				74	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)R		Gold/silver alloy	F.147 and F.148 may be part of the same object
F.149	BM	1991,0702.95				167	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R		Gold/silver alloy	
F.150	BM	1991,0702.96				175	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Gold/silver alloy	
F.151	BM	1991,0702.228.b				451	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C)R		Gold/silver alloy	
F.152	BM	1991,0702.228.a				451	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C)R		Gold/silver alloy	
F.153	BM	1991,0407.44.a			SN/AD		1990	Area 4	Hoard F pit; excavated find, surface trowelling	Torc/bracelet	(2P(2P))R		Gold/silver alloy	
F.154	BM	1991,0501.144				78	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(3P))R		Gold/silver alloy	F.154–7 may be part of the same torc
F.155	BM	1991,0702.17				23	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(3P))R		Gold/silver alloy	F.154–7 may be part of the same torc
F.156	BM	1991,0501.87				75	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(3P))R		Gold/silver alloy	F.154–7 may be part of the same torc
F.157	BM	1991,0501.88				76	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(3P))R		Gold/silver alloy	F.154–7 may be part of the same torc
F.158	BM	1991,0501.191				172	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(3P))R		Gold/silver alloy	
F.159	BM	1991,0501.193				174	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P(2P))R		Gold/silver alloy	
F.160	BM	1991,0501.192				173	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Gold/silver alloy	
F.161	BM	1991,0501.189				169	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(4P))T		Gold/silver alloy	
F.162	BM	1991,0702.92				161	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C)3Q+2T	BUFFER	Copper alloy	F.162–5 may be part of the same torc

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F.163	BM	1991,0702.94				163	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C)3Q+2T		Copper alloy	F.162–5 may be part of the same torc
F.164	BM	1991,0702.123				243	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C)3Q+2T	BUFFER	Copper alloy	F.162–5 may be part of the same torc
F.165	BM	1991,0702.135				255	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C)3Q+2T		Copper alloy	F.162–5 may be part of the same torc
F.166	BM	1991,0702.132				251	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C)T		Copper alloy	
F.167	BM	1991,0702.122				242	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C)T		Copper alloy	
F.168	BM	1991,0702.121				241	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C)T	BUFFER	Copper alloy	
F.169	BM	1991,0702.61				302, 303	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6CZ(2PZ))R	BUFFER	Copper alloy	
F.170	BM	1991,0702.274				501c	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	
F.171	BM	1991,0702.88				154	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)T		Copper alloy	
F.172	BM	1991,0702.14				92, 93	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)T		Copper alloy	
F.173	BM	1991,0702.140				263	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	
F.174	BM	1991,0501.213				235	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(3P))R		Copper alloy	
F.175	BM	1991,0702.169				336	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.175–8 may be from the same torc
F.176	BM	1991,0702.161				328	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.175–8 may be from the same torc
F.177	BM	1991,0702.156				322	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.175–8 may be from the same torc
F.178	BM	1991,0702.158				325	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.175–8 may be from the same torc
F.179	BM	1991,0702.117				236	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P+ 3P))R	BUFFER	Copper alloy	
F.180	BM	1991,0702.164				331	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.180–4 may be part of the same object
F.181	BM	1991,0702.172				339	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.180–4 may be part of the same object
F.182	BM	1991,0702.111				229	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.180–4 may be part of the same object
F.183	BM	1991,0702.112				230	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.180–4 may be part of the same object
F.184	BM	1991,0702.116				234	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.180–4 may be part of the same object
F.185	BM	1991,0702.49				210, 211, 212, 213	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc		RING/ TORUS	Copper alloy	
F.186	BM	1991,0702.54				391, 402, 404, 405, 408, 409	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(4P)R	LOOP	Copper alloy	
F.187	BM	1991,0702.16				15	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(8C)T	BUFFER	Copper alloy	
F.188	BM	1991,0702.139				258	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(7C)T	BUFFER	Copper alloy	
F.189	BM	1991,0702.120				239	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C)3R+3T		Copper alloy	

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F.190	BM	1991,0702.124				244	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C)T		Copper alloy	F.190–6 may be part of the same torc
F.191	BM	1991,0702.125				244	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C)T		Copper alloy	F.190–6 may be part of the same torc
F.192	BM	1991,0702.126				245	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C)T		Copper alloy	F.190–6 may be part of the same torc
F.193	BM	1991,0702.128				247	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C)T		Copper alloy	F.190–6 may be part of the same torc
F.194	BM	1991,0702.129				248	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(?6C)T		Copper alloy	F.190–6 may be part of the same torc
F.195	BM	1991,0702.131				250	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(6C)T		Copper alloy	F.190–6 may be part of the same torc
F.196	BM	1991,0702.134				253	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(?C)T		Copper alloy	F.190–6 may be part of the same torc
F.197	BM	1991,0702.127				246	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C)T		Copper alloy	F.197–8 may be part of the same torc
F.198	BM	1991,0702.130				249	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(5C)T		Copper alloy	F.197–8 may be part of the same torc
F.199	BM	1991,0702.136				256	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4C)T		Copper alloy	
F.200	BM	1991,0702.133				252	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(5C)T		Copper alloy	
F.201	BM	1991,0702.18				28, 89, 171, 265	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(4C)R		Copper alloy	
F.202	BM	1991,0702.1				11	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(4P(6C))T	BUFFER	Copper alloy	Almost certainly the pair to F.203
F.203	BM	1991,0702.13				99	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(4P(6C))T	BUFFER	Copper alloy	Almost certainly the pair to F.202
F.204	BM	1991,0702.76				410	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?3C(2P))R	LOOP	Copper alloy	May be part of the same object as F.205
F.205	BM	1991,0702.74				411, 412, 423, 425, 428, 431, 436, 438, 439, 442, 443, 447, 471	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?3C(2P))R		Copper alloy	May be part of the same object as F.204
F.206	BM	1991,0702.20				49	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(2P))R	LOOP	Copper alloy	
F.207	BM	1991,0702.15				14	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(7C(2P))R	TORUS	Copper alloy	
F.208	BM	1991,0702.52				342, 403	1990	Area 4	Hoard F pit; metal-detected find August 1990	Bracelet	(2P)T	LOOP/HOOK	Copper alloy	
F.209	BM	1991,0702.53				272, 273, 274, 340, 341, 343, 344, 345	1990	Area 4	Hoard F pit; metal-detected find August 1990	Bracelet	(2P)T	LOOP	Copper alloy	
F.210	BM	1991,0702.224				448	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet		LOOP	Copper alloy	

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F.211	BM	1991,0702.81				145	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	
F.212	BM	1991,0407.44.b			SN/AD		1990	Area 4	Hoard F pit; excavated find, surface trowelling	Torc/bracelet	(2P)R		Copper alloy	
F.213	BM	1991,0407.45.f			SN/AE; SN/AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Torc/bracelet	(2P)R		Copper alloy	
F.214	BM	1991,0407.65.d			SN/AG		1990	Area 4	Hoard F pit; excavated find, within hoard pit, down to bottom	Torc/bracelet	(2P)R		Copper alloy	
F.215	BM	1991,0702.73				268, 415, 422, 424, 426, 429, 430, 432, 433, 434, 435, 437, 440, 441, 445, 446, 469, 470	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	
F.216	BM	1991,0702.213				393	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	
F.217	BM	1991,0702.276			SN/AC		1990	Area 4	Hoard F pit; excavated find, surface trowelling	Torc/bracelet	(?C)T		Copper alloy	
F.218	BM	1991,0702.209				388	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.219	BM	1991,0702.210				389	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.220	BM	1991,0702.217				397	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.221	BM	1991,0702.193				371	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.222	BM	1991,0702.195				373	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.223	BM	1991,0702.211				390	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.224	BM	1991,0702.216				396	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.225	BM	1991,0702.273				501b	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.226	BM	1991,0702.275			SN/AC		1990	Area 4	Hoard F pit; excavated find, surface trowelling	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.227	BM	1991,0702.78				142	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.228	BM	1991,0702.77				140	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.229	BM	1991,0702.190				368	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.230	BM	1991,0702.79				143	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.231	BM	1991,0702.185				363	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.232	BM	1991,0702.186				364	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object

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F.233	BM	1991,0702.196				374	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.234	BM	1991,0702.189				367	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.235	BM	1991,0702.192				370	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.236	BM	1991,0702.201				379	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.237	BM	1991,0702.187				365	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.238	BM	1991,0702.191				369	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.239	BM	1991,0702.197				375	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.240	BM	1991,0702.188				366	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P)R		Copper alloy	F.218–40 may be part of the same object
F.241	BM	1991,0702.19					1990	Area 4	Found inside F.43 during conservation	Torc/bracelet	(?P(2P))R		Copper alloy	
F.242	BM	1991,0702.223				444	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?2P)R		Copper alloy	
F.243	BM	1991,0702.142				270	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P)R		Copper alloy	
F.244	BM	1991,0702.194				372	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(3P))R		Copper alloy	
F.245	BM	1991,0702.57				261	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P)R		Copper alloy	
F.246	BM	1991,0702.180				358	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)T		Copper alloy	
F.247	BM	1991,0702.60				401, 406, 413	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4P)R		Copper alloy	
F.248	BM	1991,0702.175				352	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(5C)3P+2T		Copper alloy	
F.249	BM	1991,0702.141				264	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(5C)T	BUFFER	Copper alloy	
F.250	BM	1991,0702.181				359	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(5C)T		Copper alloy	
F.251	BM	1991,0702.173				350	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(5C)T		Copper alloy	
F.252	BM	1991,0702.174				351	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?5C)T		Copper alloy	
F.253	BM	1991,0702.183				361	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?5C)T		Copper alloy	
F.254	BM	1991,0702.176				354	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?5C)T		Copper alloy	
F.255	BM	1991,0702.58				254	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)R		Copper alloy	
F.256	BM	1991,0702.184				362	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)T	LOOP	Copper alloy	F.256–61 may be part of the same object
F.257	BM	1991,0702.178				356	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)T		Copper alloy	F.256–61 may be part of the same object
F.258	BM	1991,0702.179				357	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)T		Copper alloy	F.256–61 may be part of the same object
F.259	BM	1991,0702.23				114	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)T		Copper alloy	F.256–61 may be part of the same object
F.260	BM	1991,0702.93				162	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)T		Copper alloy	F.256–61 may be part of the same object
F.261	BM	1991,0702.177				355	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(6C)T		Copper alloy	F.256–61 may be part of the same object
F.262	BM	1991,0702.154				301	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(??)R		Copper alloy	

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F.263	BM	1991,0702.153				300	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc / bracelet	(??)R		Copper alloy	
F.264	BM	1991,0702.248				474	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)R		Copper alloy	
F.265	BM	1991,0702.151				298	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)Q		Copper alloy	F.265–6 may be part of the same object
F.266	BM	1991,0702.152				299	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)Q		Copper alloy	F.265–6 may be part of the same object
F.267	BM	1991,0702.233				456	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)R		Copper alloy	
F.268	BM	1991,0702.263				489	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)R		Copper alloy	
F.269	BM	1991,0702.232				455	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)R		Copper alloy	
F.270	BM	1991,0702.231				454	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)R		Copper alloy	
F.271	BM	1991,0702.253				479	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.272	BM	1991,0702.238				461	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.273	BM	1991,0702.235				458	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.274	BM	1991,0702.237				460	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.275	BM	1991,0702.234				457	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.276	BM	1991,0702.236				459	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.277	BM	1991,0702.242				465	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.278	BM	1991,0702.230				453	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.279	BM	1991,0702.241				464	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.280	BM	1991,0702.240				463	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(??)T		Copper alloy	F.271–80 may be part of the same object
F.281	BM	1991,0702.266				492	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R		Copper alloy	
F.282	BM	1991,0407.45.g			SN/AE; SN/ AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Wire/?torc/ ?bracelet	(?C)R		Copper alloy	
F.283	BM	1991,0702.256				482	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R	?LOOP	Copper alloy	F.283–8 may be part of the same object
F.284	BM	1991,0702.264				490	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R	?LOOP	Copper alloy	F.283–8 may be part of the same object
F.285	BM	1991,0702.268				494	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R	?LOOP	Copper alloy	F.283–8 may be part of the same object
F.286	BM	1991,0702.270				496	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R	?LOOP	Copper alloy	F.283–8 may be part of the same object
F.287	BM	1991,0702.267				493	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R	?LOOP	Copper alloy	F.283–8 may be part of the same object
F.288	BM	1991,0702.269				495	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R	?LOOP	Copper alloy	F.283–8 may be part of the same object
F.289	BM	1991,0702.258				484	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R		Copper alloy	F.289–90 may be part of the same object
F.290	BM	1991,0702.250				476	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R		Copper alloy	F.289–90 may be part of the same object
F.291	BM	1991,0702.265				491	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)R		Copper alloy	

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F.292	BM	1991,0702.247				473	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc / bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.293	BM	1991,0702.254				480	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc / bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.294	BM	1991,0702.260				486	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc / bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.295	BM	1991,0702.244				467	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc / bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.296	BM	1991,0702.251				477	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc / bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.297	BM	1991,0702.259				485	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.298	BM	1991,0702.243				466	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.299	BM	1991,0702.252				478	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.300	BM	1991,0702.245				468	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.301	BM	1991,0702.257				483	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.302	BM	1991,0702.261				487	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.303	BM	1991,0702.262				488	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.304	BM	1991,0702.249				475	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.305	BM	1991,0702.255				481	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.306	BM	1991,0407.45.d			SN/AE; SN/ AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.307	BM	1991,0407.65.c			SN/AG		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to bottom	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.308	BM	1991,0702.246				472	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.309	BM	1991,0702.239				462	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.292–309 may be part of the same object
F.310	BM	1991,0702.90				159	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.311	BM	1991,0702.91				160	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.312	BM	1991,0702.89				158	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.313	BM	1991,0702.150				283	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.314	BM	1991,0702.147				280	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.315	BM	1991,0702.148				281	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.316	BM	1991,0407.45.c			SN/AE; SN/ AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.317	BM	1991,0702.145				278	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.318	BM	1991,0702.146				279	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.319	BM	1991,0702.149				282	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object

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F.320	BM	1991,0702.143				276	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.321	BM	1991,0702.229				452	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.322	BM	1991,0407.44.c			SN/AD		1990	Area 4	Hoard F pit; excavated find from surface trowelling	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.323	BM	1991,0702.144				277	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?C)T		Copper alloy	F.310–23 may be part of the same object
F.324	BM	1991,0407.45.i			SN/AE; SN/ AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Wire/?torc/ ?bracelet	(?C)R		Copper alloy	
F.325	BM	1991,0702.198				376	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/?torc/ ?bracelet	(?P)R		Copper alloy	
F.326	BM	1991,0702.202				381	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?2P(2P))R	LOOP	Copper alloy	F.326 and F.327 join
F.327	BM	1991,0702.203				382	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?2P(2P))R		Copper alloy	F.326 and F.327 join
F.328	BM	1991,0702.105				223	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc / bracelet	(?C(2P))R		Copper alloy	F.328–35 may be part of the same object
F.329	BM	1991,0702.101				219	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc	(?C(2P))R		Copper alloy	F.328–35 may be part of the same object
F.330	BM	1991,0702.102				220	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc	(?C(2P))R		Copper alloy	F.328–35 may be part of the same object
F.331	BM	1991,0702.106				224	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc / bracelet	(?C(2P))R		Copper alloy	F.328–35 may be part of the same object
F.332	BM	1991,0702.107				225	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc/bracelet	(?C(2P))R		Copper alloy	F.328–35 may be part of the same object
F.333	BM	1991,0702.104				222	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc / bracelet	(?C(2P))R		Copper alloy	F.328–35 may be part of the same object
F.334	BM	1991,0702.100				216	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc/bracelet	(?C(2P))R		Copper alloy	F.328–35 may be part of the same object
F.335	BM	1991,0702.103				221	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire/torc/bracelet	(?C(2P))R		Copper alloy	F.328–35 may be part of the same object
F.336	BM	1991,0702.86				152	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	F.336 and 337 may be part of the same object
F.337	BM	1991,0702.85				151	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	F.336 and 337 may be part of the same object
F.338	BM	1991,0407.45.e			SN/AE; SN/ AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Torc/bracelet	(?C(2P))R		Copper alloy	
F.339	BM	1991,0702.200				378	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	
F.340	BM	1991,0407.65.b			SN/AG		1990	Area 4	Hoard F pit; excavated find, within hoard pit, down to bottom	Torc/bracelet	(?C(2P))R		Copper alloy	
F.341	BM	1991,0702.207				386	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	
F.342	BM	1991,0702.218				398	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	
F.343	BM	1991,0702.206				385	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	
F.344	BM	1991,0407.45.b			SN/AE; SN/ AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Torc/bracelet	(?C(2P))R		Copper alloy	
F.345	BM	1991,0702.214				394	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	F.345–6 may be part of the same object
F.346	BM	1991,0702.208				387	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	F.345–6 may be part of the same object
F.347	BM	1991,0702.199				377	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(2P))R		Copper alloy	

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F.348	BM	1991,0702.222				414	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(3P))R		Copper alloy	
F.349	BM	1991,0702.80				144	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?P(2P))R		Copper alloy	
F.350	BM	1991,0702.215				395	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?P(2P))R		Copper alloy	
F.351	BM	1991,0702.87				153	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(4C(2P))R	TORUS	Copper alloy	May be part of the same object as F.336–7
F.352	BM	1991,0407.45.a			SN/AE; SN/AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Torc	(2P(2P))R		Copper alloy	F.352–60 may be part of the same torc
F.353	BM	1991,0702.109				227	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(2P))R	LOOP	Copper alloy	F.352–60 may be part of the same torc
F.354	BM	1991,0702.110				228	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(2P))R	LOOP	Copper alloy	F.352–60 may be part of the same torc
F.355	BM	1991,0702.108				226	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(2P))R		Copper alloy	F.352–60 may be part of the same torc
F.356	BM	1991,0702.113				231	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(2P))R		Copper alloy	F.352–60 may be part of the same torc
F.357	BM	1991,0702.114				232	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(2P))R		Copper alloy	F.352–60 may be part of the same torc
F.358	BM	1991,0702.115				233	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(2P))R		Copper alloy	F.352–60 may be part of the same torc
F.359	BM	1991,0702.118				237	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(2P))R		Copper alloy	F.352–60 may be part of the same torc
F.360	BM	1991,0702.119				238	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc	(2P(2P))R		Copper alloy	F.352–60 may be part of the same torc
F.361	BM	1991,0702.84				150	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R	LOOP	Copper alloy	
F.362	BM	1991,0702.160				327	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R	LOOP	Copper alloy	F.362–3 may be part of the same object
F.363	BM	1991,0702.82				148	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R	LOOP	Copper alloy	F.362–3 may be part of the same object
F.364	BM	1991,0702.162				329	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.365	BM	1991,0702.163				330	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.366	BM	1991,0702.83				149	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.367	BM	1991,0702.155				321	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.368	BM	1991,0702.159				326	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.369	BM	1991,0702.165				332	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.370	BM	1991,0702.166				333	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.371	BM	1991,0702.170				337	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.372	BM	1991,0702.167				334	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.373	BM	1991,0702.171				338	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.374	BM	1991,0702.168				335	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(2P(2P))R		Copper alloy	F.364–74 may be part of the same object
F.375	BM	1991,0702.75				346, 347, 348, 349	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(?C(3P(2P)))R		Copper alloy	

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F.376	BM	1991,0702.157				323	1990	Area 4	Hoard F pit; metal-detected find August 1990	Torc/bracelet	(3P(2P))R		Copper alloy	
F.377	BM	1991,0501.195				179	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip			Gold/silver alloy	
F.378	BM	1991,0501.196				181	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip			Gold/silver alloy	
F.379	BM	1991,0501.197				182	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip			Gold/silver alloy	
F.380	BM	1991,0501.218				287	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip			Gold/silver alloy	
F.381	BM	1991,0702.97				177	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip			Gold/silver alloy	
F.382	BM	1991,0407.45.j			SN/AE; SN/AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Strip			Copper alloy	
F.383	BM	1991,0702.98				178	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip			Copper alloy	
F.384	BM	1991,0702.55				285	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip			Copper alloy	
F.385	BM	1991,0702.56				284, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 497, 498, 500	1990	Area 4	Hoard F pit; metal-detected find August 1990	Strip			Copper alloy	
F.386	BM	1991,0501.162				97	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.387	BM	1991,0501.166				125	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.388	BM	1991,0501.171				132	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.389	BM	1991,0501.172				133	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.390	BM	1991,0501.202				194	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.391	BM	1991,0501.203				200	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.392	BM	1991,0702.28				127	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.393	BM	1991,0702.36				311	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.394	BM	1991,0702.38				313	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.395	BM	1991,0702.39				314	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.396	BM	1991,0702.32				191, 197	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.397	BM	1991,0702.33				193	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.398	BM	1991,0501.205				203	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large/small ring			Gold/silver alloy	
F.399	BM	1991,0702.34				198, 199	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.400	BM	1991,0501.204				201	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	

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F.401	BM	1991,0501.169				130	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.402	BM	1991,0501.170				131	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large/small ring			Gold/silver alloy	
F.403	BM	1991,0501.73				61	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Gold/silver alloy	
F.404	BM	1991,0702.26				124, 195, 196	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Copper alloy	
F.405	BM	1991,0702.27				126	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Copper alloy	
F.406	BM	1991,0702.37				312, 315, 319	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Copper alloy	
F.407	BM	1991,0702.40				316, 318, 320	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Copper alloy	
F.408	BM	1991,0702.41				317	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Copper alloy	
F.409	BM	1991,0702.44				202	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Copper alloy	
F.410	BM	1991,0702.35				310	1990	Area 4	Hoard F pit; metal-detected find August 1990	Small ring			Copper alloy	
F.411	BM	1991,0702.277			SN/AC		1990	Area 4	Hoard F pit; excavated find, surface trowelling	Small ring			Copper alloy	
F.412	BM	1991,0501.150				83	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.413	BM	1991,0501.199				187	1990	Area 4	Hoard F pit; metal-detected find August 1990	?Large ring			Gold/silver alloy	
F.414	BM	1991,0501.200				188	1990	Area 4	Hoard F pit; metal-detected find August 1990	?Large ring			Gold/silver alloy	
F.415	BM	1991,0501.201				190	1990	Area 4	Hoard F pit; metal-detected find August 1990	?Large ring			Gold/silver alloy	
F.416	BM	1991,0702.24				122	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.417	BM	1991,0702.25.a-c				123, 185, 186	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.418	BM	1991,0702.31				189	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.419	BM	1991,0501.219				304, 305, 306	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.420	BM	1991,0501.220				309	1990	Area 4	Hoard F pit; metal-detected find August 1990	?Large ring			Gold/silver alloy	
F.421	BM	1991,0407.65.a			SN/AG		1990	Area 4	Hoard F pit; excavated find, within hoard pit, down to bottom	Large ring			Gold/silver alloy	
F.422	BM	1991,0501.61				57	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.423	BM	1991,0501.117				192	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.424	BM	1991,0501.60				56	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.425	BM	1991,0501.99				111	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.426	BM	1991,0501.115				121	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.427	BM	1991,0501.116				184	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Gold/silver alloy	
F.428	BM	1991,0702.21				60	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring			Copper alloy	

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F.429	BM	1991,0501.156				90	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Gold/silver alloy	
F.430	BM	1991,0702.45				206	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Copper alloy	
F.431	BM	1991,0702.99				180	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Copper alloy	
F.432	BM	1991,0407.45.h			SN/AE; SN/AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Wire			Copper alloy	
F.433	BM	1991,0702.271				499	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Copper alloy	
F.434	BM	1991,0702.225				449	1990	Area 4	Hoard F pit; metal-detected find August 1990	Wire			Copper alloy	
F.435	BM	1991,0702.5				118	1990	Area 4	Hoard F pit; metal-detected find August 1990	Large ring/?ingot/?bracelet			Copper alloy	
F.436	BM	1991,0501.74				62	1990	Area 4	Hoard F pit; metal-detected find August 1990	Amorphous lump			Gold/silver alloy	F.436 and F.437 join
F.437	BM	1991,0501.75				63	1990	Area 4	Hoard F pit; metal-detected find August 1990	Amorphous lump			Gold/silver alloy	F.436 and F.437 join
F.438	BM	1991,0501.114				120	1990	Area 4	Hoard F pit; metal-detected find August 1990	Linear ingot			Gold/silver alloy	
F.439	BM	1991,0501.198				183	1990	Area 4	Hoard F pit; metal-detected find August 1990	Linear ingot			Gold/silver alloy	
F.440	BM	1991,0702.6				119	1990	Area 4	Hoard F pit; metal-detected find August 1990	Linear ingot			Copper alloy	
F.441	BM	1991,0407.45.k			SN/AE; SN/AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Sheet			Copper alloy	
F.442	BM	1991,0407.45.l			SN/AE; SN/AF		1990	Area 4	Hoard F pit; excavated find, surface trowelling/within hoard pit, down to 25cm	Amorphous lump			Copper alloy	
F.443	BM	1991,0407.65.e			SN/AG		1990	Area 4	Hoard F pit; excavated find, within hoard pit, down to bottom	Sheet/lump			Copper alloy	
F.444	BM	1991,0407.43			SN/AH		1990	Area 4	Excavated find. Near Hoard F	Torc	(2P)R	LOOP	Gold/silver alloy	
F.445	BM	1991,0702.272			SN/AC; SN/AE; SN/AJ	501a	1990	Area 4	Hoard F pit; reconstructed from fragments.	Helmet			Copper alloy	
G.1	BM	1991,0407.1			SN/AQ		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(4P)R	RING	Gold/silver alloy	
G.2	BM	1990,1101.23			SN/BP; SN/CD; SN/CE;SN/CF; SN/CG		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(6C)T	BUFFER	Copper alloy	
G.?2	BM	1990,1101.24			SN/BO; SN/BQ; SN/CW; SN/DB; SN/DD; SN/DF; SN/DL; SN/DQ; SN/DT(ii); SN/FC; SN/FG; SN/GE; SN/GG; SN/JG		1990	Area 1	Excavated find: found loose around top level of Hoard G, and in Hoard G upper pit	Torc	?(6C)T	?BUFFER	Copper alloy	Most likely from torc G.2
G.3	BM	1991,0407.2			SN/CH		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(2P)R	LOOP	Gold/silver alloy	
G.4	BM	1991,0407.3			SN/CI		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(2P(2P))R	LOOP	Gold/silver alloy	
G.5a	BM	1991,0407.4			SN/CK		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(2PZ(2P))R	LOOP	Gold/silver alloy	

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G.5b	BM	1991,0407.4			SN/CK		1990	Area 1	Excavated find: Hoard G upper pit	Small ring			Gold/silver alloy	
G.5c	BM	1991,0407.4			SN/CK		1990	Area 1	Excavated find: Hoard G upper pit	Small ring			Gold/silver alloy	
G.5d	BM	1991,0407.4			SN/CK		1990	Area 1	Excavated find: Hoard G upper pit	Small ring			Gold/silver alloy	
G.6	BM	1990,1101.12; 1990,1101.14			SN/CL; SN/BR		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(3P(2P))R	LOOP	Copper alloy	
G.7	BM	1991,0407.5			SN/CM		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(2P)R	LOOP	Gold/silver alloy	
G.8	BM	1990,1101.16			SN/CN		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(4C)2T+2R	BUFFER	Copper alloy	
G.9	BM	1991,0407.6			SN/CO		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(2P)R	RING	Gold/silver alloy	
G.10	BM	1990,1101.17			SN/CP		1990	Area 1	Excavated find: Hoard G upper pit	Torc	(3C)R	BUFFER	Copper alloy	
G.11	BM	1991,0407.7			SN/EA		1990	Area 1	Excavated find: Hoard G lower pit	Torc	(4P)R	RING	Gold/silver alloy	
G.12	BM	1990,1101.19			SN/DW; SN/DY; SN/DZ; SN/FD; SN/FL; SN/FT; SN/GF		1990	Area 1	Excavated find: Hoard G lower pit	Torc	(6C)T	BUFFER	Copper alloy	
G.13	BM	1990,1101.1			SN/FO		1990	Area 1	Excavated find: Hoard G lower pit	Torc	(7C)Q	BUFFER	Copper alloy	
G.14	BM	1990,1101.25			SN/DX; SN/GH		1990	Area 1	Excavated find: Hoard G lower pit	Torc	(2PZ)F	LOOP	Copper alloy	
G.?14	BM	1990,1101.26			SN/FO (ii)		1990	Area 1	Excavated find: Hoard G lower pit	Torc			Copper alloy	Possibly part of the missing terminal from torc G.14, or one of the more heavily corroded torcs from the upper pit of Hoard G
G.15	BM	1990,1101.27			SN/FU; SN/FW(i)		1990	Area 1	Excavated find: Hoard G lower pit	Torc	(8C)4T+4Q	BUFFER	Copper alloy	
G.?12/ 15	BM	1990,1101.28			SN/BS; SN/BT; SN/BV; SN/CD(ii); SN/CJ; SN/CX; SN/CY; SN/CZ; SN/DG; SN/DJ; SN/DK; SN/DN; SN/DP; SN/DU(i); SN/DV(i); SN/FB; SN/FH; SN/FI; SN/FM; SN/FN; SN/FV; SN/FW(ii); SN/GB; SN/GC; SN/HF		1990	Area 1	Excavated find: found loose around and within Hoard G pit	Torc		?BUFFER	Copper alloy	Most likely part of either torc G.12 or G.15
G.16	BM	1990,1101.29			SN/DA; SN/FX; SN/GU; SN/HB; SN/HC		1990	Area 1	Excavated find: Hoard G lower pit	Torc	(5C(2P))R	BUFFER	Copper alloy	

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G.?16	BM	1990,1101.13			SN/BU; SN/CL; SN/DI; SN/DS; SN/DT(i); SN/DU(ii); SN/DV(ii); SN/GI		1990	Area 1	Excavated find: found loose around and within Hoard G pit	Torc	(?5C(2P))R	?BUFFER	Copper alloy	Very likely from torc G.16
G.17	BM	1991,0407.8			SN/GQ		1990	Area 1	Excavated find: Hoard G lower pit	Large ring			Gold/silver alloy	
G.18	BM	1991,0407.9			SN/GR		1990	Area 1	Excavated find: Hoard G lower pit	Large ring			Gold/silver alloy	
G.19	BM	1991,0407.10			SN/GS		1990	Area 1	Excavated find: Hoard G lower pit	Large ring			Gold/silver alloy	
G.20	BM	1990,1101.2			SN/GT		1990	Area 1	Excavated find: Hoard G lower pit	Large ring			Copper alloy	
H.1	BM	1990,1101.18			SN/AW; SN/CR		1990	Area 1	Excavated find: Hoard H upper pit	Torc	(6C)?R	BUFFER	Copper alloy	
H.2a	BM	1991,0407.11			SN/CS		1990	Area 1	Excavated find: Hoard H upper pit	Torc	(2PZ(2P))R	LOOP	Gold/silver alloy	
H.2b	BM	1991,0407.11			SN/CS		1990	Area 1	Excavated find: Hoard H upper pit	Torc	(2P)R	RING	Gold/silver alloy	
H.3	BM	1991,0407.12			SN/CT		1990	Area 1	Excavated find: Hoard H upper pit	Torc	(2P)R	HOOK	Gold/silver alloy	
H.4	BM	1990,1101.3			SN/CU		1990	Area 1	Excavated find: Hoard H upper pit	Torc	(3P(2P))R	RING	Copper alloy	
H.5	BM	1991,0407.13			SN/CV		1990	Area 1	Excavated find: Hoard H upper pit	Torc	(4C)R	LOOP	Gold/silver alloy	
H.6	BM	1991,0407.14			SN/DR		1990	Area 1	Excavated find: Hoard H upper pit	Torc	(2P(2PZ))R	LOOP	Gold/silver alloy	
H.7	BM	1991,0407.15			SN/FJ		1990	Area 1	Excavated find: Hoard H lower pit	Torc	(4CZ(3P(3P)))R	RING	Gold/silver alloy	
H.8	BM	1990,1101.4			SN/FK; SN/FZ		1990	Area 1	Excavated find: Hoard H lower pit	Torc	(6C)?Q	BUFFER	Copper alloy	
H.9	BM	1990,1101.8			SN/FY; SN/GK; SN/GL		1990	Area 1	Excavated find: Hoard H lower pit	Torc	(4C)R	BUFFER	Copper alloy	
H.10	BM	1990,1101.5			SN/GO		1990	Area 1	Excavated find: Hoard H lower pit	Torc	(4C(2P))R	BUFFER	Copper alloy	
H.11	BM	1990,1101.6			SN/GP		1990	Area 1	Excavated find: Hoard H lower pit	Torc	(2P)R	LOOP	Copper alloy	
J.1	BM	1991,0407.42			SN/GV; SN/GW; SN/GX; SN/GZ; SN/HG; SN/JX		1990	Area 2	Found in plough scatter around Hoard J	Torc		LOOP	Gold/silver alloy	J.1 and S.54 may be part of the same torc
J.2	BM	1991,0407.41; 1991,0407.55			SN/HA; SN/KZ		1990	Area 2	Found in plough scatter around Hoard J	Torc	(3P(2PZ))R	LOOP	Gold/silver alloy	J.2 may be part of the same torc as S.20
J.3	BM	1990,1101.30			SN/EV; SN/GY; SN/HD; SN/HL; SN/HR; SN/JC; SN/HE; SN/HH; SN/HJ; SN/HK; SN/HM		1990	Area 2	Excavated find: Hoard J pit	Torc	(?CT)	BUFFER	Copper alloy	
J.4	BM	1990,1101.32			SN/HO; SN/JF; SN/JY		1990	Area 2	Excavated find: Hoard J pit	Torc	(3P(2P))R		Copper alloy	
J.5a	BM	1990,1101.31			SN/JD; SN/JL; SN/JM; SN/JN; SN/JE; SN/JK		1990	Area 2	Excavated find: Hoard J pit	Torc	(6C)T	BUFFER	Copper alloy	
J.5b	BM	1991,0407.18			SN/JQ		1990	Area 2	Excavated find: Hoard J pit	Torc	(4CZ(2P))R	RING	Gold/silver alloy	
J.5c	BM	1991,0407.17			SN/JP		1990	Area 2	Excavated find: Hoard J pit	Torc	(2P)R	LOOP	Gold/silver alloy	

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J.6	BM	1991,0407.16			SN/JO		1990	Area 2	Excavated find: Hoard J pit	Torc	(2CZ(2P))R	RING	Gold/silver alloy	
J.7	BM	1991,0407.19			SN/JR		1990	Area 2	Excavated find: Hoard J pit	Torc	(2P(2P))R	RING	Gold/silver alloy	
J.?	BM	1990,1101.33			SN/HN		1990	Area 2	Excavated find: Hoard J pit	Torc			Copper alloy	
K.1	BM	1990,1101.34			SN/LA; SN/LB; SN/LC; SN/LD; SN/MC; SN/MD; SN/MF; SN/MH; ?ST/AC; ?ST/AJ		1990	Area 5	Excavated find: Hoard K pit	Torc	(2P)R	RING	Copper alloy	
K.2	BM	1990,1101.35			SN/LE; SN/LG; SN/LJ; SN/LM; SN/LO; SN/LP; SN/LQ; SN/LR; SN/LS; SN/LT; SN/MA; SN/MB; SN/MG		1990	Area 5	Excavated find: Hoard K pit	Torc	(?C)T+Q		Copper alloy	
K.3	BM	1990,1101.36			SN/LF; SN/LK; SN/LN		1990	Area 5	Excavated find: Hoard K pit	Torc	(6C)T		Copper alloy	
K.4	BM	1990,1101.37			SN/LL; SN/ME		1990	Area 5	Excavated find: Hoard K pit	Torc	(3P(2P))R	LOOP	Copper alloy	
K.5	BM	1991,0407.20			SN/LV		1990	Area 5	Excavated find: Hoard K pit	Torc	(2PZ)R	RING	Gold/silver alloy	
K.6	BM	1991,0407.21			SN/LX		1990	Area 5	Excavated find: Hoard K pit	Torc	(2P)R	RING	Gold/silver alloy	
K.7	BM	1991,0407.22			SN/LY		1990	Area 5	Excavated find: Hoard K pit	Torc	(8C)R	RING	Gold/silver alloy	
L.1	BM	1991,0407.23			SN/NM		1990	Area 9	Excavated find: Hoard L upper pit	Torc	(6C(2PZ(3P)))R	TORUS	Gold/silver alloy	
L.2	BM	1991,0407.24			SN/NO		1990	Area 9	Excavated find: Hoard L upper pit	Torc	(2P)F	LOOP	Gold/silver alloy	
L.3	BM	1991,0407.25			SN/NR		1990	Area 9	Excavated find: Hoard L upper pit	Torc	(2P(2P))R	RING	Gold/silver alloy	
L.4	BM	1991,0407.26			SN/NW		1990	Area 9	Excavated find: Hoard L upper pit	Torc	(3P(2P))R	LOOP	Gold/silver alloy	
L.5	BM	1990,1101.10			SN/NY		1990	Area 9	Excavated find: Hoard L upper pit	Torc	(5C(2P))R	BUFFER	Copper alloy	
L.6	BM	1990,1101.7			SN/NZ		1990	Area 9	Excavated find: Hoard L upper pit	Torc	(7C(2P))R	BUFFER	Copper alloy	
L.7	BM	1991,0407.27			SN/OA		1990	Area 9	Excavated find: Hoard L upper pit	Torc	(2P)R	LOOP	Gold/silver alloy	
L.8	BM	1990,1101.9			SN/OS; SN/OT		1990	Area 9	Excavated find: Hoard L lower pit	Torc/bracelet	(2P(2P))R	LOOP	Copper alloy	
L.9	BM	1990,1101.11			SN/OL; SN/OL; SN/OU		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(2P(2P))R	LOOP	Copper alloy	
L.10a	BM	1991,0407.28			SN/OF		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(6C)2T+4Q	TORUS	Gold/silver alloy	
L.10b	BM	1991,0407.28			SN/OG		1990	Area 9	Excavated find: Hoard L lower pit	Torc/wire	(?2P)T		Gold/silver alloy	
L.11	BM	1991,0407.29			SN/OH		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(8CZ(2P))R	BUFFER	Gold/silver alloy	
L.12	BM	1991,0407.30			SN/OW		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(8C(2P))R	BUFFER	Gold/silver alloy	
L.13	BM	1991,0407.31			SN/OY		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(14C(2P(Z)))R	BUFFER	Gold/silver alloy	

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L.14	BM	1991,0407.32			SN/PA		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(6C(2P))R	TORUS	Gold/silver alloy	
L.15	BM	1991,0407.33			SN/PC		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(8C)T	CAGE	Gold/silver alloy	
L.16	BM	1991,0407.34			SN/PE		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(6C(2PZ))R	RING	Gold/silver alloy	
L.17	BM	1991,0407.35			SN/PG		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(8C)T	BUFFER	Gold/silver alloy	
L.18	BM	1991,0407.36			SN/PJ		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(4CZ(2P))R	RING	Gold/silver alloy	
L.19a	BM	1991,0407.37			SN/PL		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(4C(4C))T	TORUS	Gold/silver alloy	
L.19b	BM	1991,0407.37			SN/PL		1990	Area 9	Excavated find: Hoard L lower pit	Wire			Gold/silver alloy	
L.19c	BM	1991,0407.37			SN/PL		1990	Area 9	Excavated find: Hoard L lower pit	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
L.19d	BM	1991,0407.37			SN/PL		1990	Area 9	Excavated find: Hoard L lower pit	Torc/sheet	?TUBULAR (?TYPE 4/5/6)		Gold/silver alloy	
L.19e	BM	1991,0407.37			SN/PL		1990	Area 9	Excavated find: Hoard L lower pit	Strip			Gold/silver alloy	
L.19f	BM	1991,0407.37			SN/PL		1990	Area 9	Excavated find: Hoard L lower pit	Strip			Gold/silver alloy	
L.20a	BM	1991,0407.38			SN/PN		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(6C([2Px3]+[4Cx3]))R	TORUS	Gold/silver alloy	
L.20b	BM	1991,0407.38			SN/PN		1990	Area 9	Excavated find: Hoard L lower pit	Wire			Gold/silver alloy	
L.21a	BM	1991,0407.39			SN/PO		1990	Area 9	Excavated find: Hoard L lower pit	Torc	(8C(2P(2P)))R	TORUS	Gold/silver alloy	
L.21b	BM	1991,0407.39			SN/PO		1990	Area 9	Excavated find: Hoard L lower pit	Strip			Gold/silver alloy	
M.1	BM	1992,1203.7					1990–1	Wood	Hoard M; Metal detected find made Dec. 1990–April 1991	Amorphous lump			Silver-copper alloy	
M.2	BM	1992,1203.8					1990–1	Wood	Hoard M; Metal detected find made Dec. 1990–April 1991	Amorphous lump			Silver-copper alloy	
M.3	BM	1992,1203.9					1990–1	Wood	Hoard M; Metal detected find made Dec. 1990–April 1991	Amorphous lump			Silver-copper alloy	
M.4	BM	1992,1203.10					1990–1	Wood	Hoard M; Metal detected find made Dec. 1990–April 1991	Amorphous lump			Silver-copper alloy	
M.5	BM	1992,1203.11					1990–1	Wood	Hoard M; Metal detected find made Dec. 1990–April 1991	Amorphous lump			Silver-copper alloy	
M.6	BM	1991,0409.1					1990–1		Hoard M; Metal detected find made Dec. 1990–April 1991	Amorphous lump			Copper alloy	
P.1	BM	1992,1202.7			ST/GT		1991	Area 21	Metal-detected stray find from 1991 excavation	Vessel			Silver alloy	P.1–7 may be from the same silver vessel
P.2	BM	1992,1202.4			ST/GQ		1991	Area 21	Metal-detected stray find from 1991 excavation	Vessel			Silver alloy	P.1–7 may be from the same silver vessel
P.3	BM	1992,1202.9			ST/GW		1991	Area 21	Metal-detected stray find from 1991 excavation	Vessel			Silver alloy	P.1–7 may be from the same silver vessel
P.4	BM	1992,1202.8			ST/GV		1991	Area 21	Metal-detected stray find from 1991 excavation	Vessel			Silver alloy	P.1–7 may be from the same silver vessel
P.5	BM	1992,1202.6			ST/GS		1991	Area 21	Metal-detected stray find from 1991 excavation	Vessel			Silver alloy	P.1–7 may be from the same silver vessel
P.6	BM	1992,1202.5			ST/GQ		1991	Area 21	Metal-detected stray find from 1991 excavation	Vessel			Silver alloy	P.1–7 may be from the same silver vessel
P.7	BM	1992,0210.2			SM/AC		1992	Wood	Metal-detected stray find March 1992	Vessel			Silver alloy	P.1–7 may be from the same silver vessel
S.1	BM	1990,1101.42			SN/JZ		1990	Area 21	Metal-detected stray find from 1990 excavation	Socketed axe			Copper alloy	
S.2	BM	1991,0409.27					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Sword chape			Copper alloy	
S.3	NCM		YELLOW.3				2003–9	Wood	Metal-detected stray find 2003–9	Razor			Copper alloy	

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S.4	NCM		YELLOW.251				2003–9	Wood	Metal-detected stray find 2003–9	Arrowhead			Copper alloy	
S.5	NCM		YELLOW.249				2003–9	Wood	Metal-detected stray find 2003–9	Spearhead			Copper alloy	
S.6	NCM		YELLOW.250				2003–9	Wood	Metal-detected stray find 2003–9	Blade fragment; ?spearhead			Copper alloy	
S.7	NCM		YELLOW.248				2003–9	Wood	Metal-detected stray find 2003–9	?Blade fragment			Copper alloy	
S.8	NCM		YELLOW.89				2003–9	Wood	Metal-detected stray find 2003–9	Unidentified object fragment			Copper alloy	
S.9	NCM		YELLOW.2				2003–9	Wood	Metal-detected stray find 2003–9	Miniature axe			Copper alloy	
S.10	NCM		YELLOW.10				2003–9	Wood	Metal-detected stray find 2003–9	Moustache mount			Copper alloy	
S.11a	BM	1991,0407.57			SN/KD		1990	Area 3	Metal-detected stray find from 1990 excavation	Torc	TUBULAR (TYPE 4/5)		Gold/silver alloy	
S.11b	BM	1991,0407.47			SN/KD		1990	Area 3	Metal-detected stray find from 1990 excavation	Torc/bracelet	(2P)R	LOOP	Gold/silver alloy	
S.12	NCM	1999.44					?1999	Not recorded	Metal-detected stray find 1999.	Torc	TUBULAR (Type 6)		Iron	
S.13	BM	1991,0407.40			SN/RO		1990	Area 15	Metal-detected stray find from 1990 excavation	Torc	TUBULAR (TYPE 4)	BUFFER	Gold/silver alloy	
S.14	NCM		YELLOW.34				2003–9	Wood	Metal-detected stray find 2003–9	Torc	TUBULAR (TYPE 1)		Gold/silver alloy	
S.15	BM	1992,1203.6					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	?Torc	?TUBULAR (?Type 2/Type 6)		Gold/silver alloy	
S.16	NCM	1969.55.3		Burns 1971, 228–9			1968	South-west corner of the 'gold field'	Found during ploughing in 1968	Torc	(2P)R	RING	Gold/silver alloy	
S.17	NCM	1965.30.1		Burns 1971, 228–9			1964	Area 2	Found during ploughing in 1964.	Torc	(2P)R	RING	Gold/silver alloy	
S.18	NCM	1977.307					1973	To northwest of 'gold field'	Found during ploughing in 1973	Torc	(2P)R	LOOP	Gold/silver alloy	
S.19	BM	1992,1203.4					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Torc	(4P(?5C))R	BUFFER	Gold/silver alloy	
S.20	BM	1991,0501.228				507	1990	Not recorded	Metal-detected stray find August 1990	Torc	(3P(2PZ))R		Gold/silver alloy	S.20 may be part of the same torc as J.2
S.21	BM	1992,1203.3					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Torc	(?2P(2P))R	LOOP	Gold/silver alloy	
S.22	BM	1992,1203.2					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Torc	(2PZ(2P))R		Gold/silver alloy	
S.23	BM	1991,0501.231				510	1990	Not recorded	Metal-detected stray find August 1990	Torc	(4P)R		Gold/silver alloy	Fragments S.23–9 may be part of the same torc
S.24	BM	1991,0501.232				511	1990	Not recorded	Metal-detected stray find August 1990	Torc	(4P)R		Gold/silver alloy	Fragments S.23–9 may be part of the same torc
S.25	NCM	1990204					1989	Area 20	Metal-detected stray find 1989	Torc	(4P)R		Gold/silver alloy	Fragments S.23–9 may be part of the same torc
S.26	BM	1991,0501.230				509	1990	Not recorded	Metal-detected stray find August 1990	Torc		LOOP	Gold/silver alloy	Fragments S.23–9 may be part of the same torc
S.27	NCM	1990203b					1989	Area 20	Metal-detected stray find 1989.	Torc			Gold/silver alloy	Fragments S.23–9 may be part of the same torc
S.28	NCM	1990203a					1989	Area 20	Metal-detected stray find 1989	Torc			Gold/silver alloy	Fragments S.23–9 may be part of the same torc

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S.29	BM	1991,0501.229				508	1990	Not recorded	Metal-detected stray find August 1990	Torc	(?P)R		Gold/silver alloy	Fragments S.23–9 may be part of the same torc
S.30	NCM		YELLOW.93				2003–9	Wood	Metal-detected stray find 2003–9	Torc/bracelet	(3P)R		Gold/silver alloy	
S.31	NCM	1965.30.2.1		Burns 1971, 228-29			1964	Area 3	Found during ploughing in 1964	Torc	(2P)F	LOOP	Gold/silver alloy	Fragments S.31–9 may be part of the same torc
S.32	BM	1991,0407.50			SN/AO		1990	Area 1	Metal-detected stray find from 1990 excavation	Torc		LOOP	Gold/silver alloy	Fragments S.31–9 may be part of the same torc
S.33	BM	1991,0501.224				503	1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Torc		LOOP	Gold/silver alloy	Fragments S.31–9 may be part of the same torc
S.34	BM	1991,0501.226				505	1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Torc		LOOP	Gold/silver alloy	Fragments S.31–9 may be part of the same torc
S.35	BM	1991,0407.51			SN/KM		1990	Area 5	Metal-detected stray find from 1990 excavation	Torc	(2P)F		Gold/silver alloy	Fragments S.31–9 may be part of the same torc
S.36	BM	1991,0407.49			SN/AU		1990	Area 1	Metal-detected stray find from 1990 excavation	Torc	(2P)F		Gold/silver alloy	Fragments S.31–9 may be part of the same torc
S.37	BM	1992,1203.1					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Torc	(2P)F		Gold/silver alloy	Fragments S.31–9 may be part of the same torc
S.38	BM	1991,0501.223				502	1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Torc	(2P)F		Gold/silver alloy	Fragments S.31–9 may be part of the same torc
S.39	BM	1991,0501.225				504	1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Torc	(2P)F		Gold/silver alloy	Fragments S.31–9 may be part of the same torc
S.40	BM	1991,0407.66			SN/KE		1990	Area 3	Metal-detected stray find from 1990 excavation	Torc		LOOP	Gold/silver alloy	S.40 may be part of the same torc as fragments S.31–9
S.41	BM	1991,0407.59			SN/KH		1990	Area 4	Metal-detected stray find from 1990 excavation	Rod/?torc	(?2P)R		Gold/silver alloy	S.41–4 may be from the same torc
S.42	BM	1992,1203.5					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Rod/?torc	(?2P)R		Gold/silver alloy	S.41–4 may be from the same torc
S.43	BM	1992,1202.2			ST/BM		1991	Area 19	Metal-detected stray find from 1991 excavation	Rod/?torc	(?2P)R		Gold/silver alloy	S.41–4 may be from the same torc
S.44	BM	1991,0501.233			SN/NJ		1990	Not recorded	Metal-detected stray find from 1990 excavation	Rod/?torc	(?2P)R		Gold/silver alloy	S.41–4 may be from the same torc
S.45	BM	1991,0407.48			SN/RC		1990	Area 12	Metal-detected stray find from 1990 excavation	Torc/bracelet	(2P)R		Gold/silver alloy	
S.46	NCM		YELLOW.81				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump; wire; ?torc / ?bracelet			Gold/silver alloy	
S.47	NCM		YELLOW.73				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc / ?bracelet			Gold/silver alloy	
S.48	BM	1991,0407.60			SN/MY		1990	Area 9	Metal-detected stray find from 1990 excavation	Torc		BUFFER	Gold/silver alloy	
S.49	NCM		YELLOW.30				2003–9	Wood	Metal-detected stray find 2003–9	Rod/?large ring/?torc		?LOOP	Gold/silver alloy	
S.50	NCM		YELLOW.129B				2003–9	Wood	Metal-detected stray find 2003–9	Rod/?torc/ ?bracelet			Gold/silver alloy	
S.51	BM	1991,0407.53			SN/AX		1990	Area 1	Metal-detected stray find from 1990 excavation	Wire/?torc/ ?bracelet	(?2P)R		Gold/silver alloy	

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S.52	BM	1992,1202.1			ST/BP		1991	Area 20	Metal-detected stray find from 1991 excavation	Wire/?torc/ ?bracelet	(?P)R		Gold/silver alloy	
S.53	BM	1991,0407.52			SN/KF		1990	Area 4	Metal-detected stray find from 1990 excavation	Wire/?torc/ ?bracelet	(?P)R		Gold/silver alloy	
S.54	BM	1991,0407.56			SN/EE		1990	Area 2	Metal-detected stray find from 1990 excavation	Wire/?torc/ ?bracelet	(?P)R		Gold/silver alloy	S.54 and J.1 may be part of the same torc
S.55	NCM		YELLOW.78				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc / bracelet			Gold/silver alloy	
S.56	NCM		YELLOW.142				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc /bracelet			Gold/silver alloy	
S.57	NCM		YELLOW.103				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc/ ?bracelet			Gold/silver alloy	
S.58	NCM		YELLOW.91				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc/ ?bracelet			Gold/silver alloy	
S.59	NCM		YELLOW.95				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc/ ?bracelet			Gold/silver alloy	
S.60	NCM		YELLOW.122				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc/ ?bracelet			Gold/silver alloy	
S.61	NCM		YELLOW.70				2003–9	Wood	Metal-detected stray find 2003–9	Torc/bracelet			Gold/silver alloy	
S.62	NCM		YELLOW.50				2003–9	Wood	Metal-detected stray find 2003–9	Torc/bracelet / wire			Gold/silver alloy	
S.63	NCM		YELLOW.112				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc / ?bracelet			Gold/silver alloy	
S.64	NCM		YELLOW.28				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc/ ?bracelet			Gold/silver alloy	
S.65	NCM		YELLOW.144				2003–9	Wood	Metal-detected stray find 2003–9	Wire; ?torc / bracelet			Gold/silver alloy	
S.66	NCM		YELLOW.68				2003–9	Wood	Metal-detected stray find 2003–9	Wire; amorphous lump			Gold/silver alloy	
S.67	BM	1991,0407.58			SN/AP		1990	Area 1	Metal-detected stray find from 1990 excavation	Wire; ?torc/ ?bracelet			Gold/silver alloy	
S.68	BM	1991,0407.54			SN/JJ		1990	Area 2	Metal-detected stray find from 1990 excavation	Wire/?torc/ ?bracelet			Gold/silver alloy	
S.69	NCM		YELLOW.69				2003–9	Wood	Metal-detected stray find 2003–9	Ring/?torc/ ?bracelet			Gold/silver alloy	
S.70	NCM		YELLOW.60				2003–9	Wood	Metal-detected stray find 2003–9	Sheet/?torc			Gold/silver alloy	
S.71	NCM		YELLOW.36				2003–9	Wood	Metal-detected stray find 2003–9	Sheet/?torc			Gold/silver alloy	
S.72	NCM		YELLOW.138				2003–9	Wood	Metal-detected stray find 2003–9	Sheet/?torc			Gold/silver alloy	
S.73	NCM		YELLOW.64				2003–9	Wood	Metal-detected stray find 2003–9	Sheet/?torc			Gold/silver alloy	
S.74	NCM		YELLOW.67				2003–9	Wood	Metal-detected stray find 2003–9	Sheet/?torc			Gold/silver alloy	
S.75	NCM		YELLOW.158				2003–9	Wood	Metal-detected stray find 2003–9	Sheet/?torc			Gold/silver alloy	
S.76	NCM		YELLOW.66				2003–9	Wood	Metal-detected stray find 2003–9	Strip/?torc			Gold/silver alloy	
S.77	BM	1990,1101.21			SN/KP		1990	Area 5	Metal-detected stray find from 1990 excavation	Torc	(?6C)R	TORUS	Copper alloy	
S.78	BM	1992,0210.1			SM/AA		1992	Wood	Metal-detected stray find March 1992. Redeposited.	Torc		TORUS	Copper alloy	
S.79	BM	1990,1101.22			SN/EG		1990	Area 2	Metal-detected stray find from 1990 excavation	Torc	(7C)T	BUFFER	Copper alloy	
S.80	BM	1990,1101.20			SN/AV		1990	Area 1	Metal-detected stray find from 1990 excavation	Torc	(2P)R		Copper alloy	
S.81	BM	1991,0409.22			ST/HD		1991	Area 21	Metal-detected stray find from 1991 excavation, most likely from 1990 backfill.	Wire/?torc/ ?bracelet	?(?P)R		Copper alloy	

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S.82	BM	1990,1101.43			SN/MT		1990	Area 7	Metal-detected stray find from 1990 excavation	Wire/?torc/ ?bracelet		?LOOP	Copper alloy	
S.83	BM	1990,1101.48			SN/RF		1990	Area 14	Metal-detected stray find from 1990 excavation	Rod/?torc / ?bracelet			Copper alloy	
S.84	BM	1991,0407.62			SN/CQ		1990	Area 1	Metal-detected stray find from 1990 excavation	Large ring			Gold/silver alloy	
S.85	BM	1991,0501.227				506	1990	Not recorded	Metal-detected stray find August 1990	Large ring			Gold/silver alloy	
S.86	BM	1992,1202.3			ST/FS		1991	Area 21	Metal-detected stray find from 1991 excavation, most likely from 1990 backfill	Strip; ?large/small ring			Gold/silver alloy	
S.87	NCM		YELLOW.31				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /small ring			Gold/silver alloy	
S.88	NCM		YELLOW.124				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.89	NCM		YELLOW.32				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.90	NCM		YELLOW.52				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.91	NCM		YELLOW.38				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.92	NCM		YELLOW.106				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.93	NCM		YELLOW.99				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.94	NCM		YELLOW.94				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.95	NCM		YELLOW.97				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.96	NCM		YELLOW.77				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.97	NCM		YELLOW.131				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.98	NCM		YELLOW.98				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Gold/silver alloy	
S.99	NCM		YELLOW.192				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large /?small ring			Copper alloy	
S.100	NCM		YELLOW.42				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?large/?small ring			Copper alloy	
S.101	BM	2009,4213.20			SN/PY		1990	Area 10	Metal-detected stray find from 1990 excavation	Lump ingot			Gold/silver alloy	
S.102	BM	2009,4213.21			SN/QA		1990	Area 11	Metal-detected stray find from 1990 excavation	Lump ingot			Gold/silver alloy	
S.103	NCM		YELLOW.135				2003–9	Wood	Metal-detected stray find 2003–9	Lump ingot			Gold/silver alloy	
S.104	BM	1991,0409.28					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Lump ingot			?Tin/copper alloy	
S.105	NCM		YELLOW.245				2003–9	Wood	Metal-detected stray find 2003–9	Triangular ingot			Copper alloy; ?gold/silver alloy	
S.106	BM	1991,0409.4			ST/AK		1991	Area 17	Metal-detected stray find from 1991 excavation	Lump ingot			Copper alloy/?Silver alloy/?Lead alloy	
S.107	NCM		YELLOW.47				2003–9	Wood	Metal-detected stray find 2003–9	Lump ingot			Copper alloy	
S.108	NCM		YELLOW.195				2003–9	Wood	Metal-detected stray find 2003–9	Lump ingot			Copper alloy/lead alloy	
S.109	NCM		YELLOW.143				2003–9	Wood	Metal-detected stray find 2003–9	Lump ingot			Copper alloy	

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S.110	NCM		YELLOW.118				2003–9	Wood	Metal-detected stray find 2003–9	Lump ingot			Copper alloy	
S.111	NCM		YELLOW.116				2003–9	Wood	Metal-detected stray find 2003–9	Lump ingot			Copper alloy	
S.112	NCM		YELLOW.141				2003–9	Wood	Metal-detected stray find 2003–9	Linear ingot			Gold/silver alloy	
S.113	NCM		YELLOW.140				2003–9	Wood	Metal-detected stray find 2003–9	Linear ingot			Gold/silver alloy	
S.114	NCM		YELLOW.110				2003–9	Wood	Metal-detected stray find 2003–9	Linear ingot			Gold/silver alloy	
S.115	NCM		YELLOW.129A				2003–9	Wood	Metal-detected stray find 2003–9	Linear ingot			Gold/silver alloy	
S.116	NCM		YELLOW.134				2003–9	Wood	Metal-detected stray find 2003–9	Linear ingot			Gold/silver alloy	
S.117	BM	1990,1101.38			SN/AL		1990	Not recorded	Metal-detected stray find from 1990 excavation	Linear ingot			Copper alloy	
S.118	BM	1991,0409.12			ST/DC		1991	Area 23	Metal-detected stray find from 1991 excavation	Linear ingot			Copper alloy	
S.119	NCM		YELLOW.173				2003–9	Wood	Metal-detected stray find 2003–9	Linear ingot			Copper alloy	
S.120	BM	1991,0409.18			ST/EG		1991	Area 25	Metal-detected stray find from 1991 excavation	Linear ingot/?wire			Copper alloy	
S.121	NCM		YELLOW.155				2003–9	Wood	Metal-detected stray find 2003–9	Linear ingot			Copper alloy	
S.122	NCM		YELLOW.153				2003–9	Wood	Metal-detected stray find 2003–9	Linear ingot			Copper alloy	
S.123	BM	1991,0409.13			ST/DE		1991	Area 23	Metal-detected stray find from 1991 excavation	?Ingot/?fitting			Copper alloy	
S.124	BM	1991,0409.6			ST/BG		1991	Area 18	Metal-detected stray find from 1991 excavation	?Ingot/?fitting			Copper alloy	
S.125	NCM		YELLOW.61				2003–9	Wood	Metal-detected stray find 2003–9	Wire			Gold/silver alloy	
S.126	NCM		YELLOW.62				2003–9	Wood	Metal-detected stray find 2003–9	Wire/?tool			Gold/silver alloy	
S.127	NCM		YELLOW.198				2003–9	Wood	Metal-detected stray find 2003–9	Rod			Copper alloy	
S.128	NCM		YELLOW.175				2003–9	Wood	Metal-detected stray find 2003–9	Wire			Copper alloy	
S.129	NCM		YELLOW.29				2003–9	Wood	Metal-detected stray find 2003–9	Wire/strip			Copper alloy	
S.130	BM	1990,1101.49			SN/RR		1990	Not recorded	Metal-detected stray find from 1990 excavation, found during backfilling.	Casting sprue			Copper alloy	
S.131	NCM		YELLOW.247				2003–9	Wood	Metal-detected stray find 2003–9	Casting sprue			Copper alloy	
S.132	NCM		YELLOW.63				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump; wire			Gold/silver alloy	
S.133	BM	1992,1203.12					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Amorphous lump; wire			Gold/silver alloy	
S.134	BM	1991,0407.61			SN/JW		1990	Area 2; SN21	Metal-detected stray find from 1990 excavation	Amorphous lump; wire			Gold/silver alloy	
S.135	NCM		YELLOW.72				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump; wire			Gold/silver alloy	
S.136	NCM		YELLOW.71				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump; wire			Gold/silver alloy	
S.137	NCM		YELLOW.128				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump (worked)			Gold/silver alloy	
S.138	NCM		YELLOW.85				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump (worked)			Gold/silver alloy	
S.139	NCM		YELLOW.74				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump; ?disc			Gold/silver alloy; copper alloy	

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S.140	NCM		YELLOW.130				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump; sheet; wire			Copper alloy; Gold/silver alloy	
S.141	NCM		YELLOW.113				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.142	NCM		YELLOW.136				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.143	NCM		YELLOW.82				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.144	NCM		YELLOW.148				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.145	NCM		YELLOW.108				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.146	NCM		YELLOW.261				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.147	NCM		YELLOW.92				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.148	NCM		YELLOW.120				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.149	NCM		YELLOW.125				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.150	NCM		YELLOW.126				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.151	NCM		YELLOW.149				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.152	NCM		YELLOW.51				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.153	NCM		YELLOW.35				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.154	NCM		YELLOW.37				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.155	NCM		YELLOW.65				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.156	NCM		YELLOW.90				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.157	NCM		YELLOW.100				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.158	NCM		YELLOW.109				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.159	NCM		YELLOW.150				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.160	NCM		YELLOW.104				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.161	NCM		YELLOW.121				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.162	NCM		YELLOW.152				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.163	NCM		YELLOW.56				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.164	NCM		YELLOW.87				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.165	NCM		YELLOW.115				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.166	NCM		YELLOW.123				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.167	NCM		YELLOW.154				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.168	NCM		YELLOW.80				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	

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S.169	NCM		YELLOW.79				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.170	NCM		YELLOW.114				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.171	NCM		YELLOW.137				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.172	NCM		YELLOW.101				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.173	NCM		YELLOW.105				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.174	NCM		YELLOW.151				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.175	NCM		YELLOW.83				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.176	NCM		YELLOW.107				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.177	NCM		YELLOW.88				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.178	NCM		YELLOW.117				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Gold/silver alloy	
S.179	BM	1991,0409.16			ST/DT		1991	Area 24	Metal-detected stray find from 1991 excavation	Amorphous lump			Lead alloy	
S.180	NCM		YELLOW.246				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.181	BM	1991,0409.21			ST/GZ		1991	Area 21	Metal-detected stray find from 1991 excavation	Amorphous lump			Copper alloy	
S.182	NCM		YELLOW.266				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.183	NCM		YELLOW.200				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.184	NCM		YELLOW.265				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy; ?lead alloy	
S.185	BM	1990,1101.46			SN/OE		1990	Area 9	Metal-detected stray find from 1990 excavation	Amorphous lump			Copper alloy	
S.186	NCM		YELLOW.193				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.187	BM	1990,1101.44			SN/MX		1990	Area 9	Metal-detected stray find from 1990 excavation	Amorphous lump			Copper alloy	
S.188	NCM		YELLOW.252				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.189	BM	1991,0409.9			ST/CA		1991	Area 20	Metal-detected stray find from 1991 excavation	Amorphous lump			?Lead; ?silver alloy	
S.190	BM	1991,0409.2			ST/AA		1991	Area 20	Metal-detected stray find from 1991 excavation	Amorphous lump			Copper alloy	
S.191	BM	1991,0409.10			ST/CC		1991	Area 20	Metal-detected stray find from 1991 excavation	Amorphous lump			?Lead; ?silver alloy	
S.192	NCM		YELLOW.264				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.193	NCM		YELLOW.197				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Lead alloy	
S.194	BM	1991,0409.7			ST/BL		1991	Area 19	Metal-detected stray find from 1991 excavation	Amorphous lump			Copper alloy	
S.195	BM	1990,1101.39			SN/BD		1990	Area 1	Metal-detected stray find from 1990 excavation	Amorphous lump			Copper alloy	
S.196	BM	1990,1101.45			SN/MZ		1990	Area 9	Metal-detected stray find from 1990 excavation	Amorphous lump			Copper alloy	
S.197	BM	1991,0409.17			ST/DV		1991	Area 24	Metal-detected stray find from 1991 excavation	Amorphous lump			Copper alloy	
S.198	NCM		YELLOW.190				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	

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S.199	BM	1991,0409.26					1990–1	Not recorded	Metal-detected stray find Dec. 1990–April 1991	Amorphous lump			Copper alloy	
S.200	NCM		YELLOW.182				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.201	NCM		YELLOW.161				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.202	NCM		YELLOW.162				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.203	NCM		YELLOW.132				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.204	NCM		YELLOW.263				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy; ?lead alloy	
S.205	NCM		YELLOW.181				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.206	BM	1990,1101.41			SN/EN		1990	Area 2	Metal-detected stray find from 1990 excavation	Amorphous lump			Copper alloy	
S.207	NCM		YELLOW.86				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.208	NCM		YELLOW.84				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.209	BM	1991,0409.3			ST/AE		1991	Area 16	Metal-detected stray find from 1991 excavation	Amorphous lump			Copper alloy	
S.210	NCM		YELLOW.53				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.211	NCM		YELLOW.159				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.212	BM	1991,0409.14			ST/DF		1991	Not recorded	Metal-detected stray find from 1991 excavation, most likely from 1990 backfill.	Amorphous lump			Copper alloy	
S.213	NCM		YELLOW.46				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy; ?lead alloy	
S.214	NCM		YELLOW.48				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.215	NCM		YELLOW.163				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.216	NCM		YELLOW.170				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.217	NCM		YELLOW.165				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.218	NCM		YELLOW.185				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.219	NCM		YELLOW.58				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.220	NCM		YELLOW.260				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.221	NCM		YELLOW.147				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.222	NCM		YELLOW.262				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.223	NCM		YELLOW.55				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.224	NCM		YELLOW.160				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.225	NCM		YELLOW.96				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.226	NCM		YELLOW.176				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.227	NCM		YELLOW.54				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.228	NCM		YELLOW.146				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.229	NCM		YELLOW.111				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	

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S.230	NCM		YELLOW.102				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.231	NCM		YELLOW.57				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.232	NCM		YELLOW.59				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.233	NCM		YELLOW.177				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Copper alloy	
S.234	NCM		YELLOW.49				2003–9	Wood	Metal-detected stray find 2003–9	Amorphous lump			Iron	
S.235	NCM		YELLOW.4				2003–9	Wood	Metal-detected stray find 2003–9	Bead/?torc/ ?bracelet			Copper alloy; iron	Pair to S.236
S.236	NCM		YELLOW.258				2003–9	Wood	Metal-detected stray find 2003–9	Bead/?torc/ ?bracelet			Iron; copper alloy	Pair to S.235
S.237	NCM		YELLOW.6				2003–9	Wood	Metal-detected stray find 2003–9	Bead/?torc/ ?bracelet			Copper alloy	S.237–9 may be from the same beaded torc or bracelet
S.238	NCM		YELLOW.7				2003–9	Wood	Metal-detected stray find 2003–9	Bead/?torc/ ?bracelet			Copper alloy; Iron	S.237–9 may be from the same beaded torc or bracelet
S.239	NCM		YELLOW.9				2003–9	Wood	Metal-detected stray find 2003–9	Bead/?torc/ ?bracelet			Copper alloy	S.237–9 may be from the same beaded torc or bracelet
S.240	NCM		YELLOW.8				2003–9	Wood	Metal-detected stray find 2003–9	Bead/?torc/ ?bracelet			Iron	
S.241	NCM		YELLOW.5				2003–9	Wood	Metal-detected stray find 2003–9	?Bead/?torc/ ?bracelet			Copper alloy	
S.242	NCM		YELLOW.157				2003–9	Wood	Metal-detected stray find 2003–9	Brooch spring			?Silver alloy	
S.243	NCM		YELLOW.11				2003–9	Wood	Metal-detected stray find 2003–9	Brooch			Copper alloy	
S.244	BM	1992,0210.4			SA/BL		1992	Trench 6	Excavated find: Enclosure ditch: SA6/2, section C, Layer 1	Brooch			Copper alloy	
S.245	NCM		YELLOW.267				2003–9	Wood	Metal-detected stray find 2003–9	Brooch			Copper alloy (tinned)	
S.246	BM	1992,0210.5			SA/DV		1992	Trench 6	Excavated find: Ditch: SA6/7	Strip/?brooch			Copper alloy	
S.247	BM	1991,0409.15			ST/DG		1991	Not recorded	Metal-detected stray find from 1991 excavation, most likely from 1990 backfill	Finger ring			Copper alloy	
S.248	BM	1991,0409.19			ST/FO		1991	Area 26	Metal-detected stray find from 1991 excavation	?Finger ring			Copper alloy, ?glass	
S.249	NCM		YELLOW.17				2003–9	Wood	Metal-detected stray find 2003–9	Button/fastener			Copper alloy	S.249–52 may be from the same object
S.250	NCM		YELLOW.16				2003–9	Wood	Metal-detected stray find 2003–9	Button/fastener			Copper alloy	S.249–52 may be from the same object
S.251	NCM		YELLOW.18				2003–9	Wood	Metal-detected stray find 2003–9	Button/fastener			Copper alloy	S.249–52 may be from the same object
S.252	NCM		YELLOW.19				2003–9	Wood	Metal-detected stray find 2003–9	Button/fastener			Copper alloy	S.249–52 may be from the same object
S.253	BM	1993,0201.1					1989	Trench 15	Metal-detected stray find 1989.	Terminal			Copper alloy	Pair to S.254
S.254	BM	1993,0201.2					1989	Trench 15	Metal-detected stray find 1989.	Terminal			Copper alloy	Pair to S.253
S.255	BM	1991,0409.24			ST/HX		1991	Not recorded	Metal-detected stray find from 1991 excavation	Linch-pin / fitting			Copper alloy	
S.256	BM	1991,0409.8			ST/BR		1991	Area 20	Metal-detected stray find from 1991 excavation	Terret			Copper alloy	
S.257	BM	1991,0409.8			ST/BS		1991	Area 20	Metal-detected stray find from 1991 excavation	Terret			Copper alloy	
S.258	BM	1991,0409.11			ST/CE		1991	Not recorded	Metal-detected stray find from 1991 excavation	Fitting			Copper alloy; iron	

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S.259	BM	1990,1101.47			SN/PZ		1990	Area 11	Metal-detected stray find from 1990 excavation	Fitting			Copper alloy	
S.260	NCM		YELLOW.139				2003–9	Wood	Metal-detected stray find 2003–9	Fitting			Copper alloy	
S.261	NCM		YELLOW.254				2003–9	Wood	Metal-detected stray find 2003–9	Rod /?strap fitting			Copper alloy	
S.262	NCM		YELLOW.188				2003–9	Wood	Metal-detected stray find 2003–9	?Strap fitting			Copper alloy	
S.263	NCM		YELLOW.240				2003–9	Wood	Metal-detected stray find 2003–9	Strip/?strap fitting			Copper alloy	
S.264	NCM		YELLOW.39				2003–9	Wood	Metal-detected stray find 2003–9	Strap fitting			Copper alloy; iron	
S.265	NCM		YELLOW.26				2003–9	Wood	Metal-detected stray find 2003–9	Strap fitting			Copper alloy; iron	
S.266	NCM		YELLOW.241				2003–9	Wood	Metal-detected stray find 2003–9	Sheet/?ring; rivet			Copper alloy; iron	
S.267	NCM		YELLOW.168				2003–9	Wood	Metal-detected stray find 2003–9	Mount/rivet			Copper alloy	
S.268	NCM		YELLOW.20				2003–9	Wood	Metal-detected stray find 2003–9	Rivet			Copper alloy	
S.269	NCM		YELLOW.43				2003–9	Wood	Metal-detected stray find 2003–9	Rivet head			Copper alloy	
S.270	NCM		YELLOW.24				2003–9	Wood	Metal-detected stray find 2003–9	Rivet head			Copper alloy	
S.271	NCM		YELLOW.201				2003–9	Wood	Metal-detected stray find 2003–9	Rivet			Copper alloy	
S.272	NCM		YELLOW.23				2003–9	Wood	Metal-detected stray find 2003–9	Rivet head			Copper alloy	
S.273	NCM		YELLOW.22				2003–9	Wood	Metal-detected stray find 2003–9	Rivet head			Copper alloy	
S.274	NCM		YELLOW.25				2003–9	Wood	Metal-detected stray find 2003–9	Rivet head			Copper alloy	
S.275	NCM		YELLOW.257				2003–9	Wood	Metal-detected stray find 2003–9	Rivet head			Copper alloy	
S.276	NCM		YELLOW.33				2003–9	Wood	Metal-detected stray find 2003–9	Binding strip; ?shield			Copper alloy	Similar to the hide-shaped shield binding B/C.89
S.277	NCM		YELLOW.244				2003–9	Wood	Metal-detected stray find 2003–9	Binding clamp			Copper alloy	
S.278	NCM		YELLOW.27				2003–9	Wood	Metal-detected stray find 2003–9	?Binding clamp			Copper alloy	
S.279	NCM		YELLOW.40				2003–9	Wood	Metal-detected stray find 2003–9	?Binding clamp			Copper alloy	
S.280	NCM		YELLOW.186				2003–9	Wood	Metal-detected stray find 2003–9	Binding strip			Copper alloy	
S.281	NCM		YELLOW.169				2003–9	Wood	Metal-detected stray find 2003–9	Binding strip			Copper alloy	
S.282	NCM		YELLOW.178				2003–9	Wood	Metal-detected stray find 2003–9	Binding strip			Copper alloy	
S.283	NCM		YELLOW.256				2003–9	Wood	Metal-detected stray find 2003–9	Binding strip			Copper alloy	
S.284	NCM		YELLOW.127				2003–9	Wood	Metal-detected stray find 2003–9	Binding strip			Copper alloy	
S.285	NCM		YELLOW.189				2003–9	Wood	Metal-detected stray find 2003–9	?Binding strip			Copper alloy	
S.286	BM	1992,0210.6			SA/GM		1992	Trench 7	Excavated find: Ditch: SA7/5, section D	?Binding strip			Copper alloy	
S.287	BM	1991,0409.20			ST/GM		1991	Area 27	Metal-detected stray find from 1991 excavation	Strip (sheet) (decorative)			Copper alloy	
S.288	NCM		YELLOW.218				2003–9	Wood	Metal-detected stray find 2003–9	Strip; ?wire; ?rivet			Copper alloy	
S.289	NCM		YELLOW.255				2003–9	Wood	Metal-detected stray find 2003–9	Strip; rivet			Copper alloy	

Cat no.	Museum	Reg. no.	Ticket no.	Published ref.	Stead code	Ralph no.	Ex. year	Findspot	Context details	Object name	MSCC or TUB torc type	Torc terminal type	Material	Joining / related fragments?
S.290	NCM		YELLOW.212				2003–9	Wood	Metal-detected stray find 2003–9	Strip; rivet			Copper alloy	
S.291	NCM		YELLOW.213				2003–9	Wood	Metal-detected stray find 2003–9	Strip; rivet			Copper alloy	
S.292	NCM		YELLOW.217				2003–9	Wood	Metal-detected stray find 2003–9	Strip; rivet			Copper alloy	
S.293	NCM		YELLOW.205				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.294	NCM		YELLOW.208				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.295	NCM		YELLOW.167B				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.296	NCM		YELLOW.235				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.297	NCM		YELLOW.209				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.298	NCM		YELLOW.184				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.299	NCM		YELLOW.214				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.300	NCM		YELLOW.219				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.301	NCM		YELLOW.233				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.302	NCM		YELLOW.167A				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.303	NCM		YELLOW.222				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.304	NCM		YELLOW.236				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.305	NCM		YELLOW.239				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy; ?Lead alloy	
S.306	NCM		YELLOW.187				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Copper alloy	
S.307	NCM		YELLOW.45				2003–9	Wood	Metal-detected stray find 2003–9	Strip			Iron	
S.308	NCM		YELLOW.207				2003–9	Wood	Metal-detected stray find 2003–9	Sheet; rivet			Copper alloy	
S.309	NCM		YELLOW.215				2003–9	Wood	Metal-detected stray find 2003–9	Sheet; rivet			Copper alloy	
S.310	NCM		YELLOW.206				2003–9	Wood	Metal-detected stray find 2003–9	Sheet; rivet			Copper alloy	
S.311	NCM		YELLOW.228				2003–9	Wood	Metal-detected stray find 2003–9	Sheet; rivet			Copper alloy	
S.312	NCM		YELLOW.210				2003–9	Wood	Metal-detected stray find 2003–9	Sheet; rivet			Copper alloy	
S.313	NCM		YELLOW.221				2003–9	Wood	Metal-detected stray find 2003–9	Sheet; rivet			Copper alloy	
S.314	NCM		YELLOW.230				2003–9	Wood	Metal-detected stray find 2003–9	Sheet; rivet			Copper alloy	
S.315	NCM		YELLOW.216				2003–9	Wood	Metal-detected stray find 2003–9	Sheet; rivet			Copper alloy	
S.316	NCM		YELLOW.224				2003–9	Wood	Metal-detected stray find 2003–9	Sheet; rivet			Copper alloy; ?iron	

Cat no.	Museum	Reg. no.	Ticket no.	Published ref.	Stead code	Ralph no.	Ex. year	Findspot	Context details	Object name	MSCC or TUB torc type	Torc terminal type	Material	Joining / related fragments?
S.317	NCM		YELLOW.202				2003–9	Wood	Metal-detected stray find 2003–9	Thick sheet			Copper alloy	
S.318	NCM		YELLOW.204				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.319	NCM		YELLOW.133				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.320	NCM		YELLOW.253				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.321	NCM		YELLOW.259				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.322	NCM		YELLOW.171				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.323	NCM		YELLOW.203				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.324	NCM		YELLOW.242				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.325	NCM		YELLOW.237				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.326	NCM		YELLOW.231				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.327	NCM		YELLOW.164B				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.328	NCM		YELLOW.220				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.329	NCM		YELLOW.223				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.330	NCM		YELLOW.179				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.331	NCM		YELLOW.211				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.332	NCM		YELLOW.227				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.333	NCM		YELLOW.229				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.334	NCM		YELLOW.232				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.335	NCM		YELLOW.225				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.336	NCM		YELLOW.234				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.337	NCM		YELLOW.238				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.338	NCM		YELLOW.174				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.339	NCM		YELLOW.226				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.340	NCM		YELLOW.166				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.341	NCM		YELLOW.199				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.342	NCM		YELLOW.194				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.343	NCM		YELLOW.196				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	

Cat no.	Museum	Reg. no.	Ticket no.	Published ref.	Stead code	Ralph no.	Ex. year	Findspot	Context details	Object name	MSCC or TUB torc type	Torc terminal type	Material	Joining / related fragments?
S.344	NCM		YELLOW.164A				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.345	BM	1990,1101.40			SN/EF		1990	Area 2	Metal-detected stray find from 1990 excavation	Sheet			Copper alloy	
S.346	NCM		YELLOW.172				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.347	NCM		YELLOW.180				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.348	BM	1991,0409.25					1991	Area 21	Metal-detected stray find from 1991 excavation	Sheet			Copper alloy	
S.349	NCM		YELLOW.119				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.350	NCM		YELLOW.76				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.351	NCM		YELLOW.191				2003–9	Wood	Metal-detected stray find 2003–9	Sheet			Copper alloy	
S.352	BM	1991,0409.23			ST/HV		1991	Area 21	Metal-detected stray find from 1991 excavation	Knife			Iron	
S.353	BM	1992,0210.3			SA/BH		1992	Trench 5	Excavated find: Pit: SA5/3. From top 2–3cm of pit	Knife			Iron	
S.354	BM	1991,0409.5			ST/AV		1991	Area 18	Metal-detected stray find from 1991 excavation	Tweezers			Copper alloy	
S.355	BM	1990,1101.50					1990	Not recorded	Metal-detected stray find from 1990 excavation	Mail armour			Copper alloy	
S.356	NCM		YELLOW.12				2003–9	Wood	Metal-detected stray find 2003–9	Mail armour			Iron	S.356–9 may be from the same set of mail armour
S.357	NCM		YELLOW.13				2003–9	Wood	Metal-detected stray find 2003–9	Mail armour			Iron	S.356–9 may be from the same set of mail armour
S.358	NCM		YELLOW.14				2003–9	Wood	Metal-detected stray find 2003–9	Mail armour			Iron	S.356–9 may be from the same set of mail armour
S.359	NCM		YELLOW.15				2003–9	Wood	Metal-detected stray find 2003–9	Mail armour			Iron	S.356–9 may be from the same set of mail armour
S.360	NCM		YELLOW.183				2003–9	Wood	Metal-detected stray find 2003–9	Unidentified object fragment			Copper alloy	
S.361	NCM		YELLOW.75				2003–9	Wood	Metal-detected stray find 2003–9	Unidentified object fragment			Copper alloy; iron	
S.362	NCM		YELLOW.44				2003–9	Wood	Metal-detected stray find 2003–9	Unidentified object fragment			Copper alloy	
S.363	NCM		YELLOW.243				2003–9	Wood	Metal-detected stray find 2003–9	Unidentified object fragment			Copper alloy	
S.364	NCM		YELLOW.41				2003–9	Wood	Metal-detected stray find 2003–9	Unidentified object fragment			Copper alloy	
S.365	NCM		YELLOW.145				2003–9	Wood	Metal-detected stray find 2003–9	Unidentified object fragment			Copper alloy	

Concordance with Clarke (1954)

Clarke (1954) published Snettisham Hoards A–E. He used two separate, simultaneous cataloguing systems to organise finds from Hoards A–D by both hoard and type. He assigned each find a number within the hoard (e.g. 'Hd. B No. 1') but the actual listing of finds was done not by hoard but by object type. For this purpose, Clarke divided the finds into seven groups, giving an 'inventory' of each. These find types are listed here along with the abbreviations used for these Clarke groups in this volume:

- Tubular torcs (TT)
- Loop terminal torcs (LT)
- Buffer terminal torcs (BT)
- Ingot bracelets (here corresponding to large rings, and given abbreviation RL)
- Ingot rings (here corresponding to small rings, and given abbreviation R)
- Sheet bronze (SB)
- Metal 'cake' (MC)
- Miscellaneous objects (M)

While Clarke's division of object types is not followed closely in this volume, these categories were used in earlier studies, such as Northover's compositional analyses of the NCM material, and thus these 'inventory numbers' (e.g. BT1, LT20) are referred to in Chapter 18 and Appendix 5.

In this volume, objects have been treated by hoard, and within hoard by material and then by object type (see explanation of cataloguing ordering in Chapter 14). New numbering has been introduced for the Hoard A–D material for four reasons: to ensure comparable numbering between both BM and NCM material (e.g. the grouping of interlinked objects); to reflect the fact that cataloguing carried out for this volume identified new connections/distinctions between object fragments (see below); because some fragments not illustrated in Clarke (1954) could not be securely assigned to their Clarke catalogue entries; and since not all objects from Hoards A, B and C were included in Clarke's publication. In the full catalogue entries for Hoards A–D in Chapter 14, the Clarke references are given, or a note included that the object was not published by Clarke. In the cases of objects which were not illustrated in Clarke's publication, photocopies taken by Peter Northover in the 1980s (now held in the BM archive) were used for cross-referencing purposes to ensure correct IDs.

Since Clarke's catalogue has been the main point of reference for the Hoard A–D Snettisham material for many decades, a complete concordance is also included here to assist the reader in cross-referencing between these publications. Two tables are given below. The first lists the objects in order of their Clarke hoard number. The format used by Clarke (e.g. 'Hd. B No. 1'), is kept here to avoid confusion with the catalogue numbers used in this volume (e.g. B.27). The second table below lists the objects in order of their Clarke inventory number, i.e. grouped by object type, in the order they are presented in Clarke's publication. For a summary of Clarke references ordered by the catalogue numbers used in this volume, see the main concordance table for all objects.

The objects from Hoards A–D not published by Clarke are: B.10, B.12, B.13, B.14, B.18, B.19, C.32, C.33, C.34, C.35, C.36, C.37, C.38, C.39, C.40, C.41, C.42, C.43, C.44, B/C.23, B/C.46, B/C.63, B/C.96.

Table of Hoard A–D material by Clarke (1954) hoard number

Clarke hoard no.	Cat. no. (this volume)	Clarke inv. no.	Full Clarke (1954) reference
Hd. A No. 1	A.1	TT1	Clarke 1954, 37; pls i, ii; Tubular Torc 1
Hd. A No. 2	A.2	TT2	Clarke 1954, 38; pls i, ii; Tubular Torc 2
Hd. A No. 3	A.3	TT3	Clarke 1954, 38–9; pls i, ii; Tubular Torc 3
Hd. A No. 4	A.4	TT4	Clarke 1954, 39; Tubular Torc 4
Hd. A No. 4	A.5	TT4	Clarke 1954, 39, pl. i; Tubular Torc 4
Hd. A No. 4	A.6	TT4	Clarke 1954, 39; pl. i; Tubular Torc 4
Hd. A No. 4	A.7	TT4	Clarke 1954, 39; pl. i; Tubular Torc 4
N/A	A.8	N/A	Clarke 1954, 39; fig. 6
Hd. B No. 1	B.27	MC1	Clarke 1954, 58 (cake), no. 1; pl. xiii, upper
Hd. B No. 2	B.26	MC2	Clarke 1954, 58 (cake), no. 2; pl. xiii, upper
Hd. B No. 3	B.21–B.23	RL11	Clarke 1954, 54, no. 11
Hd. B No. 4	B.24	RL15	Clarke 1954, 54, no. 15
Hd. B No. 5	B.20	RL12	Clarke 1954, 54, no. 12
Hd. B No. 6	B.1b	RL13	Clarke 1954, 54, no. 13; pl. xii, in group
Hd. B No. 7	B.1a	RL14	Clarke 1954, 54, no. 14; pl. xii, in group
Hd. B No. 8	B.28	M1	Clarke 1954, 58 (Misc.), no. 1; pl. xiii, lower
Hd. B No. 9	B.25	R11	Clarke 1954, 56, no. 11; pl. xii
Hd. B No. 10	B.1c	R12	Clarke 1954, 56, no. 12; pl. xii, in group
Hd. B No. 11	B.1h	R14	Clarke 1954, 56, no. 14; pl. xii, bottom left of group
Hd. B No. 12	B.1d	R1	Clarke 1954, 55, no. 1; pl. xii, bottom right of group
Hd. B No. 13	B.1e	LT1	Clarke 1954, 46, no. 1; pl. xii, top left of group
Hd. B No. 14	B.2	LT2	Clarke 1954, 46, no. 2; pl. xii, no. 2
Hd. B No. 15	B.1f	LT3	Clarke 1954, 46, no. 3; pl. xii, no. 3 and in group, centre right
Hd. B No. 16	B.1g	LT4	Clarke 1954, 46, no. 4; pl. xii, no. 4
Hd. B No. 17	B.7	LT5	Clarke 1954, 46, no. 5
Hd. B No. 18	B.8	LT6	Clarke 1954, 46, no. 6; pl. ix
Hd. B No. 19	B.4	LT7	Clarke 1954, 47, no. 7; pl. xii
Hd. B No. 20	B.3	LT8	Clarke 1954, 47, no. 8; pl. ix
Hd. B No. 21	B.5	LT14	Clarke 1954, 47, no. 14; pl. ix
Hd. B No. 22	B.6	LT15	Clarke 1954, 47, no. 15; pl. ix
Hd. B No. 23	B.11	LT19	Clarke 1954, 47, no. 19; pl. ix
Hd. B No. 24	B.9, B.15, B.17	LT20	Clarke 1954, 47, no. 20
Hd. B No. 25	B.16	LT21	Clarke 1954, 47, no. 21
Hd. B No. 26	B.29–33	M3	Clarke 1954, 58 (Misc.), no. 3
Hd. C No. 1	C.57–61	M4	Clarke 1954, 58 (Misc.), no. 4; fig. 9
Hd. C No. 2	C.45	MC4	Clarke 1954, 58 (cake), no. 4; pl. xiii, upper
Hd. C No. 3	C.46	RL1	Clarke 1954, 54, no. 1
Hd. C No. 4	C.48	R2	Clarke 1954, 55, no. 2
Hd. C No. 5	C.49	R3	Clarke 1954, 55, no. 3
Hd. C No. 6	C.47	R15	Clarke 1954, 56, no. 15; pl. xii
Hd. C No. 7	C.54	SB2	Clarke 1954, 57, no. 2; pl. xiii, lower
Hd. C No. 8	C.51	SB5	Clarke 1954, 57, no. 5; pl. xiii, lower
Hd. C No. 9	C.52–C.53	SB3	Clarke 1954, 57, no. 3; pl. xiii, lower
Hd. C No. 10	C.55–C.56	SB6	Clarke 1954, 57, no. 6
Hd. C No. 11	C.50	MC3	Clarke 1954, 58 (cake), no. 3; pl. xiii, upper, 3

Hd. C No. 12	C.6–C.12, C.15–16, C.18	LT9	Clarke 1954, 47, no. 9; pl. ix
Hd. C No. 13	C.14	LT10	Clarke 1954, 47, no. 10
Hd. C No. 14	C.13, C.19–C.20	LT11	Clarke 1954, 47, no. 11; pl. ix (C.20 not pictured)
Hd. C No. 15	C.17	MC5	Clarke 1954, 58 (cake), no. 5
Hd. C No. 16	C.1–5, C.21	LT12	Clarke 1954, 47, no. 12
Hd. C No. 17	C.22, C.26	BT1	Clarke 1954, 52, no. 1; pl. xi, right
Hd. C No. 18	C.25	BT2	Clarke 1954, 52, no. 2; pl. xi, right
Hd. C No. 19	C.23–C.24, C.28–30	LT22	Clarke 1954, 47, no. 22
Hd. C No. 20	C.27, C.31	BT3	Clarke 1954, 52, no. 3; pl. xi, right
Hd. B/C No. 1	B/C.65	RL2	Clarke 1954, 54, no. 2; fig. 7
Hd. B/C No. 2	B/C.67	RL3	Clarke 1954, 54, no. 3
Hd. B/C No. 3	B/C.66	RL4	Clarke 1954, 54, no. 4; fig. 7
Hd. B/C No. 4	B/C.68	RL5	Clarke 1954, 54, no. 5; fig. 7
Hd. B/C No. 5	B/C.69	RL6	Clarke 1954, 54, no. 6
Hd. B/C No. 6	B/C.71	RL7	Clarke 1954, 54, no. 7; fig. 7
Hd. B/C No. 7	B/C.72	RL8	Clarke 1954, 54, no. 8
Hd. B/C No. 8	B/C.70	RL9	Clarke 1954, 54, no. 9
Hd. B/C No. 9	B/C.73–B/C.76	RL10	Clarke 1954, 54, no. 10
Hd. B/C No. 10 (Listed as 'Hd. C No. 10' in Clarke 1954, in error)	B/C.64	R4	Clarke 1954, 55, no. 4
Hd. B/C No. 11	B/C.77	R5	Clarke 1954, 55, no. 5
Hd. B/C No. 12	B/C.78	R6	Clarke 1954, 55, no. 6
Hd. B/C No. 13	B/C.82	R7	Clarke 1954, 55, no. 7
Hd. B/C No. 14	B/C.79	R8	Clarke 1954, 55, no. 8
Hd. B/C No. 15	B/C.83	R9	Clarke 1954, 55, no. 9; pl. xii
Hd. B/C No. 16	B/C.80	R10	Clarke 1954, 55, no. 10
Hd. B/C No. 17	B/C.81	R13	Clarke 1954, 56, no. 13
Hd. B/C No. 18	B/C.85	MC6	Clarke 1954, 58 (cake), no. 6; pl. xiii, upper
Hd. B/C No. 19	B/C.84	MC7	Clarke 1954, 58 (cake), no. 7; pl. xiii, upper
Hd. B/C No. 20	B/C.86	MC8	Clarke 1954, 58 (cake), no. 8; pl. xiii, upper
Hd. B/C No. 21	B/C.87	MC9	Clarke 1954, 58 (cake), no. 9; pl. xiii, upper
Hd. B/C No. 22	B/C.88	SB4	Clarke 1954, 57, no. 4; pl. xiii, lower; fig. 8
Hd. B/C No. 23	B/C.89	SB1	Clarke 1954, 57, no. 1; pl. xiii, lower
Hd. B/C No. 24	B/C.91–B/C.95	SB7	Clarke 1954, 57, no. 7
Hd. B/C No. 25	B/C.90	M2	Clarke 1954, 58 (Misc.), no. 2; pl. xiii, lower
Hd. B/C No. 26	B/C.1	LT16	Clarke 1954, 47, no. 16; pl. ix
Hd. B/C No. 27	B/C.6	LT17	Clarke 1954, 47, no. 17; pl. ix
Hd. B/C No. 28	B/C.2	LT18	Clarke 1954, 47, no. 18; pl. ix
Hd. B/C No. 29	B/C.47–8	LT23	Clarke 1954, 47, no. 23; pl. viii; pl. ix
Hd. B/C No. 30	B/C.50	LT24	Clarke 1954, 47, no. 24; pl. viii
Hd. B/C No. 31	B/C.49, B/C.51–3, B/C.56, B/C.60–2	LT25	Clarke 1954, 47, no. 25

Hd. B/C No. 32	B/C.42–B/C.45	LT26	Clarke 1954, 47, no. 26
Hd. B/C No. 33	B/C.54–5	LT27	Clarke 1954, 47, no. 27; pl. ix, lower left (erroneously labelled as 'no. 29')
Hd. B/C No. 34	B/C.57–B/C.59	LT28	Clarke 1954, 47, no. 28
Hd. B/C No. 35	B/C.41	LT29	Clarke 1954, 47, no. 29; pl. ix, upper right
Hd. B/C No. 36	B/C.12	LT30	Clarke 1954, 47, no. 30; pl. viii
Hd. B/C No. 37	B/C.10	LT31	Clarke 1954, 47, no. 31; pl. viii
Hd. B/C No. 38	B/C.11	LT32	Clarke 1954, 48, no. 32; pl. viii
Hd. B/C No. 39	B/C.9	LT33	Clarke 1954, 48, no. 33; pl. viii
Hd. B/C No. 40	B/C.37	LT34	Clarke 1954, 48, no. 34; pl. ix
Hd. B/C No. 41	B/C.19	LT35	Clarke 1954, 48, no. 35; pl. ix
Hd. B/C No. 42	B/C.7–8	LT36	Clarke 1954, 48, no. 36; pl. ix
Hd. B/C No. 43	B/C.25	LT37	Clarke 1954, 48, no. 37; pl. ix
Hd. B/C No. 44	B/C.16	LT38	Clarke 1954, 48, no. 38; pl. ix
Hd. B/C No. 45	B/C.20	LT39	Clarke 1954, 48, no. 39; pl. ix
Hd. B/C No. 46	B/C.17–B/C.18, B/C.21–B/C.22, B/C.26–B/C.34, B/C.38–B/C.40	LT40	Clarke 1954, 48, no. 40; pl. ix (B/C.21 is top left, mis-labelled in the plate as no. 42)
Hd. B/C No. 47	B/C.13	LT41	Clarke 1954, 48, no. 41; pl. ix
Hd. B/C No. 48	B/C.35	LT42	Clarke 1954, 48, no. 42; pl. ix
Hd. B/C No. 49	B/C.24	LT43	Clarke 1954, 48, no. 43; pl. viii
Hd. B/C No. 50	B/C.5	LT44	Clarke 1954, 48, no. 44; pl. ix
Hd. B/C No. 51	B/C.14	LT45	Clarke 1954, 48, no. 45; pl. ix
Hd. B/C No. 52	B/C.36	LT46	Clarke 1954, 48, no. 46; pl. ix
Hd. B/C No. 53	B/C.3–4	LT47	Clarke 1954, 48, no. 47; pl. ix
Hd. B/C No. 54	B/C.15	LT48	Clarke 1954, 48, no. 48; pl. ix
Hd. D No. 1	D.1a	LT13	Clarke 1954, 47, no. 13; pl. x
Hd. D No. 2	D.1b	R16	Clarke 1954, 56, no. 16; pl. x

Table of Hoard A–D material by Clarke (1954) inventory number

Clarke inv. no.	Cat. no. (this volume)	Clarke hoard no.	Full Clarke (1954) reference
TT1	A.1	Hd. A No. 1	Clarke 1954, 37; pls i, ii; Tubular Torc 1
TT2	A.2	Hd. A No. 2	Clarke 1954, 38; pls i, ii; Tubular Torc 2
TT3	A.3	Hd. A No. 3	Clarke 1954, 38–9; pls i, ii; Tubular Torc 3
TT4	A.4	Hd. A No. 4	Clarke 1954, 39, pl. i; Tubular Torc 4
TT4	A.5	Hd. A No. 4	Clarke 1954, 39, pl. i; Tubular Torc 4
TT4	A.6	Hd. A No. 4	Clarke 1954, 39; pl. i; Tubular Torc 4
TT4	A.7	Hd. A No. 4	Clarke 1954, 39; Tubular Torc 4
N/A	A.8	N/A	Clarke 1954, 39; fig. 6
LT1	B.1e	Hd. B No. 13	Clarke 1954, 46, no. 1; pl. xii, top left of group
LT2	B.2	Hd. B No. 14	Clarke 1954, 46, no. 2; pl. xii, no. 2
LT3	B.1f	Hd. B No. 15	Clarke 1954, 46, no. 3; pl. xii, no. 3 and in group, centre right
LT4	B.1g	Hd. B No. 16	Clarke 1954, 46, no. 4; pl. xii, no. 4
LT5	B.7	Hd. B No. 17	Clarke 1954, 46, no. 5
LT6	B.8	Hd. B No. 18	Clarke 1954, 46, no. 6; pl. ix
LT7	B.4	Hd. B No. 19	Clarke 1954, 47, no. 7; pl. xii
LT8	B.3	Hd. B No. 20	Clarke 1954, 47, no. 8; pl. ix
LT9	C.6–C.12, C.15–16, C.18	Hd. C No. 12	Clarke 1954, 47, no. 9; pl. ix
LT10	C.14	Hd. C No. 13	Clarke 1954, 47, no. 10
LT11	C.13, C.19–C.20	Hd. C No. 14	Clarke 1954, 47, no. 11; pl. ix (C.20 not pictured)
LT12	C.1–5, C.21	Hd. C No. 16	Clarke 1954, 47, no. 12
LT13	D.1a	Hd. D No. 1	Clarke 1954, 47, no. 13; pl. x
LT14	B.5	Hd. B No. 21	Clarke 1954, 47, no. 14; pl. ix
LT15	B.6	Hd. B No. 22	Clarke 1954, 47, no. 15; pl. ix
LT16	B/C.1	Hd. B/C No. 26	Clarke 1954, 47, no. 16; pl. ix
LT17	B/C.6	Hd. B/C No. 27	Clarke 1954, 47, no. 17; pl. ix
LT18	B/C.2	Hd. B/C No. 28	Clarke 1954, 47, no. 18; pl. ix
LT19	B.11	Hd. B No. 23	Clarke 1954, 47, no. 19; pl. ix
LT20	B.9, B.15, B.17	Hd. B No. 24	Clarke 1954, 47, no. 20
LT21	B.16	Hd. B No. 25	Clarke 1954, 47, no. 21
LT22	C.23–C.24, C.28–30	Hd. C No. 19	Clarke 1954, 47, no. 22
LT23	B/C.47–8	Hd. B/C No. 29	Clarke 1954, 47, no. 23; pl. viii; pl. ix
LT24	B/C.50	Hd. B/C No. 30	Clarke 1954, 47, no. 24; pl. viii
LT25	B/C.49, B/C.51–3, B/C.56, B/C.60–2	Hd. B/C No. 31	Clarke 1954, 47, no. 25
LT26	B/C.42–B/C.45	Hd. B/C No. 32	Clarke 1954, 47, no. 26
LT27	B/C.54–5	Hd. B/C No. 33	Clarke 1954, 47, no. 27; pl. ix, lower left (erroneously labelled as 'no. 29')
LT28	B/C.57–B/C.59	Hd. B/C No. 34	Clarke 1954, 47, no. 28
LT29	B/C.41	Hd. B/C No. 35	Clarke 1954, 47, no. 29; pl. ix, upper right

LT30	B/C.12	Hd. B/C No. 36	Clarke 1954, 47, no. 30; pl. viii
LT31	B/C.10	Hd. B/C No. 37	Clarke 1954, 47, no. 31; pl. viii
LT32	B/C.11	Hd. B/C No. 38	Clarke 1954, 48, no. 32; pl. viii
LT33	B/C.9	Hd. B/C No. 39	Clarke 1954, 48, no. 33; pl. viii
LT34	B/C.37	Hd. B/C No. 40	Clarke 1954, 48, no. 34; pl. ix
LT35	B/C.19	Hd. B/C No. 41	Clarke 1954, 48, no. 35; pl. ix
LT36	B/C.7–8	Hd. B/C No. 42	Clarke 1954, 48, no. 36; pl. ix
LT37	B/C.25	Hd. B/C No. 43	Clarke 1954, 48, no. 37; pl. ix
LT38	B/C.16	Hd. B/C No. 44	Clarke 1954, 48, no. 38; pl. ix
LT39	B/C.20	Hd. B/C No. 45	Clarke 1954, 48, no. 39; pl. ix
LT40	B/C.17–B/C.18, B/C.21–B/C.22, B/C.26–B/C.34, B/C.38–B/C.40	Hd. B/C No. 46	Clarke 1954, 48, no. 40; pl. ix (B/C.21 is top left, mis-labelled in the plate as no. 42)
LT41	B/C.13	Hd. B/C No. 47	Clarke 1954, 48, no. 41; pl. ix
LT42	B/C.35	Hd. B/C No. 48	Clarke 1954, 48, no. 42; pl. ix
LT43	B/C.24	Hd. B/C No. 49	Clarke 1954, 48, no. 43; pl. viii
LT44	B/C.5	Hd. B/C No. 50	Clarke 1954, 48, no. 44; pl. ix
LT45	B/C.14	Hd. B/C No. 51	Clarke 1954, 48, no. 45; pl. ix
LT46	B/C.36	Hd. B/C No. 52	Clarke 1954, 48, no. 46; pl. ix
LT47	B/C.3–4	Hd. B/C No. 53	Clarke 1954, 48, no. 47; pl. ix
LT48	B/C.15	Hd. B/C No. 54	Clarke 1954, 48, no. 48; pl. ix
BT1	C.22, C.26	Hd. C No. 17	Clarke 1954, 52, no. 1; pl. xi, right
BT2	C.25	Hd. C No. 18	Clarke 1954, 52, no. 2; pl. xi, right
BT3	C.27, C.31	Hd. C No. 20	Clarke 1954, 52, no. 3; pl. xi, right
RL1	C.46	Hd. C No. 3	Clarke 1954, 54, no. 1
RL2	B/C.65	Hd. B/C No. 1	Clarke 1954, 54, no. 2; fig. 7
RL3	B/C.67	Hd. B/C No. 2	Clarke 1954, 54, no. 3
RL4	B/C.66	Hd. B/C No. 3	Clarke 1954, 54, no. 4; fig. 7
RL5	B/C.68	Hd. B/C No. 4	Clarke 1954, 54, no. 5; fig. 7
RL6	B/C.69	Hd. B/C No. 5	Clarke 1954, 54, no. 6
RL7	B/C.71	Hd. B/C No. 6	Clarke 1954, 54, no. 7; fig. 7
RL8	B/C.72	Hd. B/C No. 7	Clarke 1954, 54, no. 8
RL9	B/C.70	Hd. B/C No. 8	Clarke 1954, 54, no. 9
RL10	B/C.73–B/C.76	Hd. B/C No. 9	Clarke 1954, 54, no. 10
RL11	B.21–B.23	Hd. B No. 3	Clarke 1954, 54, no. 11
RL12	B.20	Hd. B No. 5	Clarke 1954, 54, no. 12
RL13	B.1b	Hd. B No. 6	Clarke 1954, 54, no. 13; pl. xii, in group
RL14	B.1a	Hd. B No. 7	Clarke 1954, 54, no. 14; pl. xii, in group
RL15	B.24	Hd. B No. 4	Clarke 1954, 54, no. 15
R1	B.1d	Hd. B No. 12	Clarke 1954, 55, no. 1; pl. xii, bottom right of group
R2	C.48	Hd. C No. 4	Clarke 1954, 55, no. 2
R3	C.49	Hd. C No. 5	Clarke 1954, 55, no. 3
R4	B/C.64	Hd. B/C No. 10 (Listed as 'Hd. C No. 10' in Clarke 1954, in error)	Clarke 1954, 55, no. 4
R5	B/C.77	Hd. B/C No. 11	Clarke 1954, 55, no. 5
R6	B/C.78	Hd. B/C No. 12	Clarke 1954, 55, no. 6
R7	B/C.82	Hd. B/C No. 13	Clarke 1954, 55, no. 7
R8	B/C.79	Hd. B/C No. 14	Clarke 1954, 55, no. 8
R9	B/C.83	Hd. B/C No. 15	Clarke 1954, 55, no. 9 (pl. xii)
R10	B/C.80	Hd. B/C No. 16	Clarke 1954, 55, no. 10

R11	B.25	Hd. B No. 9	Clarke 1954, 56, no. 11; pl. xii
R12	B.1c	Hd. B No. 10	Clarke 1954, 56, no. 12; pl. xii, in group
R13	B/C.81	Hd. B/C No. 17	Clarke 1954, 56, no. 13
R14	B.1h	Hd. B No. 11	Clarke 1954, 56, no. 14; pl. xii, bottom left of group
R15	C.47	Hd. C No. 6	Clarke 1954, 56, no. 15; pl. xii
R16	D.1b	Hd. D No. 2	Clarke 1954, 56, no. 16; pl. x
SB1	B/C.89	Hd. B/C No. 23	Clarke 1954, 57, no. 1; pl. xiii, lower
SB2	C.54	Hd. C No. 7	Clarke 1954, 57, no. 2; pl. xiii, lower
SB3	C.52–C.53	Hd. C No. 9	Clarke 1954, 57, no. 3; pl. xiii, lower
SB4	B/C.88	Hd. B/C No. 22	Clarke 1954, 57, no. 4; pl. xiii, lower; fig. 8
SB5	C.51	Hd. C No. 8	Clarke 1954, 57, no. 5; pl. xiii, lower
SB6	C.55–C.56	Hd. C No. 10	Clarke 1954, 57, no. 6
SB7	B/C.91–B/C.95	Hd. B/C No. 24	Clarke 1954, 57, no. 7
MC1	B.27	Hd. B No. 1	Clarke 1954, 58 (cake), no. 1; pl. xiii, upper
MC2	B.26	Hd. B No. 2	Clarke 1954, 58 (cake), no. 2; pl. xiii, upper
MC3	C.50	Hd. C No. 11	Clarke 1954, 58 (cake), no. 3; pl. xiii, upper, 3
MC4	C.45	Hd. C No. 2	Clarke 1954, 58 (cake), no. 4; pl. xiii, upper
MC5	C.17	Hd. C No. 15	Clarke 1954, 58 (cake), no. 5
MC6	B/C.85	Hd. B/C No. 18	Clarke 1954, 58 (cake), no. 6; pl. xiii, upper
MC7	B/C.84	Hd. B/C No. 19	Clarke 1954, 58 (cake), no. 7; pl. xiii, upper
MC8	B/C.86	Hd. B/C No. 20	Clarke 1954, 58 (cake), no. 8; pl. xiii, upper
MC9	B/C.87	Hd. B/C No. 21	Clarke 1954, 58 (cake), no. 9; pl. xiii, upper
M1	B.28	Hd. B No. 8	Clarke 1954, 58 (Misc.), no. 1; pl. xiii, lower
M2	B/C.90	Hd. B/C No. 25	Clarke 1954, 58 (Misc.), no. 2; pl. xiii, lower
M3	B.29–33	Hd. B No. 26	Clarke 1954, 58 (Misc.), no. 3
M4	C.57–61	Hd. C No. 1	Clarke 1954, 58 (Misc.), no. 4; fig. 9

Key differences from Clarke's catalogue

In general, although numbers have been standardised and updated, there is a one-to-one concordance between entries in Clarke's catalogue and that in this volume. In certain cases, objects or fragments grouped together by Clarke have been subdivided here, to reflect the fact that they represent separate individual objects. For example, Clarke grouped the nails he believed to be from Hoards B and C under single numbers (Clarke's Hd. B No. 26, Hd. C No. 1), whilst we separate them. In several cases a large number of wire fragments were grouped, which can now be identified as coming from different torcs, based on diameter or construction (e.g. Clarke's Hd. B/C No. 32, where the fragments exhibit different twist directions, or the wires from Hd. B/C No. 46 or Hd. C No. 12, which are of varying diameter). We have also been more cautious than Clarke in grouping fragments of ring or torc wire which may have been deliberately fragmented (e.g. Hd. B No. 3, Hd. C No. 16), or similar/related fragments which may or may not be from the same object (e.g. Clarke's Tubular torc number 4, or Hd. B/C No. 9). This subdivision means that, in some cases, Northover's compositional analyses of the NCM material (which were labelled according to Clarke's listings) can only be assigned to a group of objects falling under a range of catalogue numbers in this volume, not to precise fragments (see Chapter 18 and Appendix 5 for this analytical work).

In a few cases, objects have been grouped differently here from Clarke's catalogue in more significant ways. This is most notable in the case of the buffer terminal torcs from Hoard C, and certain loop and ring terminal torcs from the mixed B/C assemblage.

Clarke identified three buffer terminal torcs (Hd. C Nos 17, 18 and 20) from a number of fragments in Hoard C (four buffer terminals – our C.22, C.26, C.27, C.31 – and one section of neck-ring – our C.25), whilst identifying similar neck-ring fragments without terminals as being from a loop terminal torc (his Hd. C no. 19, our catalogue numbers C.23–C.24, C.28–30). Clarke groups buffer terminals C.22 and C.26 as a pair (his Hd. C No. 17), but these cannot have come from the same torc: C.26 has five wires in its coiled neck-ring, while C.22 has seven. Likewise, Clarke groups buffer terminals C.27 with C.31, but these also have different neck-ring structures. In fact, C.26 and C.27 are a better match, being similar in terms of size, wire diameter and structure. Clarke groups neck-ring fragments C.23–C.24 with C.28–30 (as his loop terminal torc Hd. C no. 19), but C.23–C.24 have different structures both from each other and from C.28–30, bearing a closer relationship to the buffer terminal fragments in some cases.

We group these various fragments differently based on their structures and sizes, and suggest that they come from at least six torcs/bracelets (rather than Clarke's four):

Cat. no. (this volume)	Clarke hoard no.	Structure	Wire diameter/ mm (approx.)	Neck-ring diameter/mm (approx.)	Element(s) present
C.22	Hd. C No. 17	(7C)T	0.8	7.0	Buffer terminal fragment
C.23	Hd. C No. 19	(6C)[3T,3R, alternating]	1.5	5.0	Neck-ring/body fragment
C.24	Hd. C No. 19	(6C)T	1.4	6.0	Neck-ring/body fragment
C.25–7	Hd. C Nos 17, 18, 20	(5C)T	1.2	6.0	Neck-ring/body fragment (C.25), two buffer terminals (C.26–7)
C.28–30	Hd. C No. 19	(5C)T	1.1	4.0	Three neck-ring/body fragments
C.31	Hd. C No. 20	(3P(2P))Q	1.0	6.0	Buffer terminal fragment

Similarly, Clarke grouped a large number of fragments under Hd. B/C No. 31 (his torc LT25), but these can now be demonstrated to be part of a number of different objects, which can more sensibly be grouped in different ways, also incorporating Clarke's Hd. B/C No. 29 (his torc LT23), and Hd. B/C No. 30 (his torc LT24):

Cat. no. (this volume)	Clarke hoard no.	Structure	Wire diameter/ mm (approx.)	Neck-ring diameter/mm (approx.)	Element(s) present
B/C.47–9	Hd. B/C No. 29, 31	(2P(2P))R	1.4	5.5	Neck-ring/body fragment (B/C.49), two ring terminals (B/C.47–8). Corroded, matt surface.
B/C.50–3	Hd. B/C No. 30, 31	(2P(2P))R	1.2	5.0	Two large fragments incorporating loop terminals (B/C.50–1), many additional small neck-ring/body fragments (B/C.52–3). Polished bronze surface, highly worn.
B/C.56	Hd. B/C No. 31	(?C(2P))R	1.0	N/A	Small neck-ring/body fragments, tight coil
B/C.60	Hd. B/C No. 31	(?C(2P))R	1.0	N/A	Small neck-ring/body fragments, loose coil
B/C.61	Hd. B/C No. 31	N/A	1.3	N/A	Possible loop terminal fragment
B/C.62	Hd. B/C No. 31	(?C(3P(2P)))R	1.0	N/A	Small neck-ring/body fragment

The evident challenges in dealing with such complex material emphasise the virtual impossibility of coming up with a firm estimate for the number of objects represented at Snettisham. The close study undertaken for this volume, organising fragments by a wide variety of nested criteria (including material, construction, wire diameter, overall size and form, colour and patina), has allowed us to discern connections and possible joins with more clarity than previously possible. No doubt, further study will continue to find new associations, or suggest different groupings.

Appendix 4
Compositional Analysis of Iron Age Gold Alloy Coins from Snettisham Parish

Matthew Ponting

Introduction

Analysis of 35 gold alloy coins from Snettisham parish was requested by Andrew Burnett, then Keeper of the Coins and Medals Department at the BM, in 1994. The aim of this work was to establish the levels of fineness of the coins, and to determine if any of the pieces were plated.

The report is reproduced here largely in its original form, with the exception of updates to relate the coin typologies used with more recent publications, and the addition of a concordance to this end (**Table A4.2**). The coins analysed are from the BM collection and are predominantly taken from two separate assemblages. Four of the coins are from the BM excavations at Snettisham (cat. nos 235, 239, 247 and 250), and most of the remainder are from a dispersed coin hoard discovered over a number of years a few km to the east (de Jersey 2014, 'Shernborne I and II', 308–10, no. 195, see also Ch. 15). All are local, East Anglian types, likely produced in the second half of the 1st century BC.

The analysis of these gold alloy coins by XRF and EDX-SEM revealed differences in fineness between stylistic groups. Trends in the precious metal components between issues within groups were also found. The base metal component was found to be added as a bronze alloy and similarities are noted between this alloy and that of contemporary potin coinage.

Analytical technique and results

Two analytical techniques were applied to the coins: X-ray fluorescence (XRF) and the energy dispersive analysing facility on a scanning electron microscope (EDX-SEM). For both techniques it was necessary to abrade and then carefully polish a small area on each coin's edge. First silicon carbide paper was used to remove the corrosion products and enriched/depleted layers. The exposed 'heart-metal' of the coin was then polished using successively finer grades of diamond paste down to lμm. The XRF spectrometer used was a Link Systems Model 290 with a molybdenum target X-ray tube operated at 45Kv. This was used to analyse an approximately 1mm^2 area of the polished interior of each coin. The elements sought were gold, silver, copper, tin and lead. The EDX-SEM used was a Jeol JSM-840 with a Link Systems 860 analyser. This was used to image the polished area at a magnification of x350 in order to enable an examination of the metal structure and the selection of sound matrix metal for analysis. Only the three major elements were quantified by this method: gold, silver and copper. Detection limits for the minor elements, lead and tin, are significantly improved on the XRF spectrometer, being in the order of 0.4% for tin and 0.07 % for lead. However, detection limits are not so important for major components whereas problems of heterogeneity and corrosion are. Consequently, the EDX-SEM values for gold, silver and copper were used here, together with the XRF values for lead and tin. The full results are shown in **Table A4.1**. The precision of the EDX-SEM values are approximately ± 1–2% for the major components and ± 10–20% for the XRF values for the minor components. Where an element was not detected in a particular coin a value of less than the detection limit for that analysis has been indicated.

BMRL no.	BM reg. no.	Cat. no. (this volume)	Gold	Silver	Copper	Tin	Lead	Classification
47912t	1991,1017.10	235	16.3	42.4	40.3	<0.4	0.61	Wolf B
47913r	1988,0403.22		12.3	37.2	46.6	3.3	0.65	Wolf C
47914p	1988,0403.23		17.0	42.9	37.0	2.5	0.58	Wolf C
47915y	1988,0403.14		16.7	26.6	52.4	4.0	0.30	Wolf D
47916w	1989,0422.12		13.6	40.6	43.6	1.7	0.48	Wolf D
47917u	1988,0403.24		14.1	37.8	45.0	2.5	0.57	Wolf D
47918s	1991,1018.1	239	20.7	38.8	38.5	1.6	0.29	Wolf D var
47919q	1989,0422.16		12.6	39.2	44.9	2.7	0.66	Wolf E
47920t	1989,0422.5		10.3	35.7	51.5	1.8	0.79	Wolf E
47921r	1989,0422.8		12.8	24.2	57.1	4.3	1.60	Wolf F
47922p	1988,0403.21		15.3	27.8	50.8	5.5	0.65	Wolf F
47923y	1989,0422.11		11.4	29.9	53.4	4.7	0.52	Wolf G
47924w	1988,0403.17		19.6	31.0	40.8	7.8	0.89	Wolf F/G
47925u	1991,1018.5	247	10.0	8.5	75.9	4.5	0.76	Wolf F/G
47926s	1988,0403.19		10.2	27.6	57.0	4.6	0.68	Wolf H
47927q	1991,1018.3	250	13.0	28.8	52.2	5.2	0.95	Wolf H
47928z	1988,0403.30		35.6	38.8	20.5	4.9	0.28	Snettisham A
47929x	1989,0422.25		34.8	35.0	28.2	1.7	0.25	Snettisham A
47930p	1988,0403.33		36.2	33.0	28.2	2.3	0.32	Snettisham B
47931y	1989,0422.26		38.8	30.2	27.0	3.6	0.42	Snettisham B
47932w	1988,0403.39		38.9	34.9	23.9	1.9	0.35	Snettisham C
47933u	1989,0422.30		38.5	31.3	29.1	0.9	0.15	Snettisham C
47934s	1988,0403.41		39.1	33.2	27.1	<0.3	0.25	Snettisham D
47935q	1989,0422.36		38.1	26.6	34.3	0.8	0.18	Snettisham D
47936z	1988,0403.36		31.2	23.7	42.9	1.8	0.38	Snettisham E
47937x	1989,0422.31		39.0	35.3	24.3	1.0	0.32	Snettisham E
47938v	1989,0422.38		37.1	23.8	38.7	<0.3	<0.07	Snettisham F
47939t	1988,0403.28		38.5	36.2	21.7	3.3	0.27	Snettisham A quarter stater
47940w	1989,0422.18		39.7	34.3	23.9	2.0	0.22	Snettisham A quarter stater
47941u	1988,0403.27		36.6	31.0	31.6	0.7	0.13	Snettisham B quarter stater
47942s	1989,0422.24		37.4	31.9	29.7	0.8	0.22	Snettisham B quarter stater
47943q	1989,1120.4		36.8	36.5	23.8	2.6	0.32	Snettisham C quarter stater
47944z	1989,1120.6		37.9	31.3	28.1	2.4	0.28	Snettisham C quarter stater
47945x	1991,1110.33		28.8	22.4	44.8	3.6	0.35	Snettisham C quarter stater
47946v	1989,1120.3		40.0	38.4	19.1	2.4	0.18	Snettisham D quarter stater

Table A4.1 Analytical results from EDX-SEM (gold, silver and copper) and XRF (lead and tin) for gold alloy coins from Snettisham parish. The precision of these analyses is approximately ± 1–2% for the major components and ± 10–20% for the XRF values for the minor components

Discussion

The coins fall into three main groups stylistically: the Snettisham-type staters (*ABC* 1402, 1405, 1408 and 1411), their quarters (*ABC* 1462 and 1465; the latter is Talbot's Early Snettisham-type quarter stater) and the Norfolk Wolf-type staters (*ABC* 1399). The sub-types discussed in this article relate to the groupings published in Hobbs 1996. The Snettisham types are similar to the Whaddon Chase types and can be compared to Allen's British La and Lb types. The Norfolk Wolf types correspond broadly to Allen's British Jb type. Talbot (2017, 8) suggests that Norfolk Wolf coins (part of the series of early local coinage) were minted in 55–15 BC, while the Snettisham types were minted around 15 BC–AD 5.

Compositionally, the Snettisham staters and their quarters are identical, being composed of a ternary alloy of 30–40% gold, 30–40% silver and the remainder predominantly copper. The Norfolk Wolf types are composed of a significantly baser ternary alloy of 10–20% gold, 30–40% silver and the remainder predominantly copper. Both types also contain small but significant amounts of tin and lead. The strong correlation of the tin with the copper suggests that a significant part of the base component of the alloy was added as a premixed bronze alloy. This is particularly apparent with the more debased Norfolk Wolf coins (see **Fig. A4.1**). By running a regression analysis after removing the two aberrant coins (both type F/G (*BMC* 262–7)) we can quantify this apparent association

Terminology used in this appendix	Hobbs (*BMC*)	*ABC*	Talbot (2017)
Wolf B	274–8	1399	Norfolk Wolf B
Wolf C	221–6	1399	
Wolf D	227–49	1399	
Wolf E	253–7	1399	
Wolf F	258–9	1399	
Wolf G	260–1	1399	
Wolf F/G	262–7	1399	
Wolf H	268–73	1399	
Snettisham A	3353–5	1402	Snettisham type
Snettisham B	3356–9	1405	
Snettisham C	3360–4	1408	
Snettisham D	3365–74	1411	
Snettisham E	3375–82	1411	
Snettisham F	3383	1411	
Snettisham quarter A	3420–1	1462	N/A
Snettisham quarter B	3422–6	1462	Snettisham-type quarter stater
Snettisham quarter C	3427–34	1462	
Snettisham quarter D	3435	1465	Early Snettisham-type quarter stater

Table A4.2 Concordance of coin typologies with the terminology used in this appendix (Hobbs (*BMC*) = Hobbs 1996; *ABC* = Cottam *et al.* 2010)

(R^2 value of 60% significant at above the 1% level) and confirm that this is a valid relationship (see regression line in **Fig. A4.1**). Furthermore, the later types (F, G, F/G and H (*BMC* 258–9, 260–1, 262–7 and 268–73 respectively) are noticeably richer in tin and copper (corresponding to an approximately 12–14% tin-bronze) and would therefore agree with the stylistic chronology and a gradual debasement over time. The F/G type coins were excluded from the calculations because their compositions differ obviously from the remainder of the series. However, it is interesting to note that both coins are also stylistically 'odd'. The very base coin (1991,1018.5; cat. no. 247) was initially thought to be a contemporary forgery, and the coin with a high tin content (1988,0403.17) is catalogued as an 'uncertain sub-type' (as Hobbs 1996, 59). Certainly these two coins are different; however, a larger sample would be needed before any firm idea can be gained as to the 'normal' compositional parameters of this series.

The Snettisham-type coins cluster tightly in the ternary plot (**Fig. A4.2**) but there is a suggestion of a chronological debasement through types D, E and F (*ABC* 1411). One type C quarter stater (*BMC* 3433; *ABC* 1462) is particularly base containing nearly twice as much base metal (44.8% copper) as the other two. This coin (1991,1110.33) was an unprovenanced metal-detector find from the Mossop collection purchased in 1991. It is likely that the coin was found in the Snettisham region and there is no reason to doubt its authenticity. However, its composition and light weight (0.98g compared to about 1.1g for others of the series) do mark it out as an inferior coin.

Comparison of the composition of the Snettisham-type staters with that of the Whaddon Chase coins (Allen's British La and Lb types) analysed by similar techniques (Cowell 1992) proved interesting (**Fig. A4.3**). The earlier British La types (*ABC* 2433, 2436, 2439) are markedly finer than either the British Lb type (*ABC* 2338 to 2347, 2442, 2445) or the Snettisham coins, with the gold being diluted primarily with silver rather than copper. In the Lb type both the silver and gold contents are reduced and replaced by copper with the copper content almost matching the silver. The Snettisham types are further debased although the silver and copper contents are not greatly increased. It is the additions of tin and lead which mark the Snettisham coins out as different from the British Lb type. However, two coins analysed by Cowell and listed as 'late' types (1919,0213.90 and 1919,0213.541; *BMC* 346, now classified as *ABC* 2344, and *BMC* 3375, now reclassified as *ABC* 1411, a Snettisham type), have a tin content of 3.7% and 1.8% respectively. These values are consistent with the Snettisham-type coins. This may suggest that the Snettisham types are related to the very latest Lb types, where a significant proportion of the base metal was added as bronze whereas only 'pure' copper had been used previously. If, as is suggested (Cowell 1992, 220), the British L type was produced directly from recycled British A2 type coins (*ABC* 482) plus base metal, we can see a distinct change in alloying practice with the use of a tin bronze. On the basis of the figures presented here, a 12% tin-bronze containing about 2% lead is suggested, which was then added to the gold-silver-copper alloy of the A2-type coinage.

A further interesting relationship is also apparent in the plot of lead against tin for the coins analysed in this study (**Fig. A4.4**). The regression line plotted indicates a significant correlation between these metals (R^2 value of 33% significant at the 1% level) although the relationship becomes more diffuse at high concentrations. It is, however, interesting that there is a higher correlation between the lead and tin than between the lead and silver (R^2 value of 0.2%). This would indicate that the bulk of the lead in these coins is

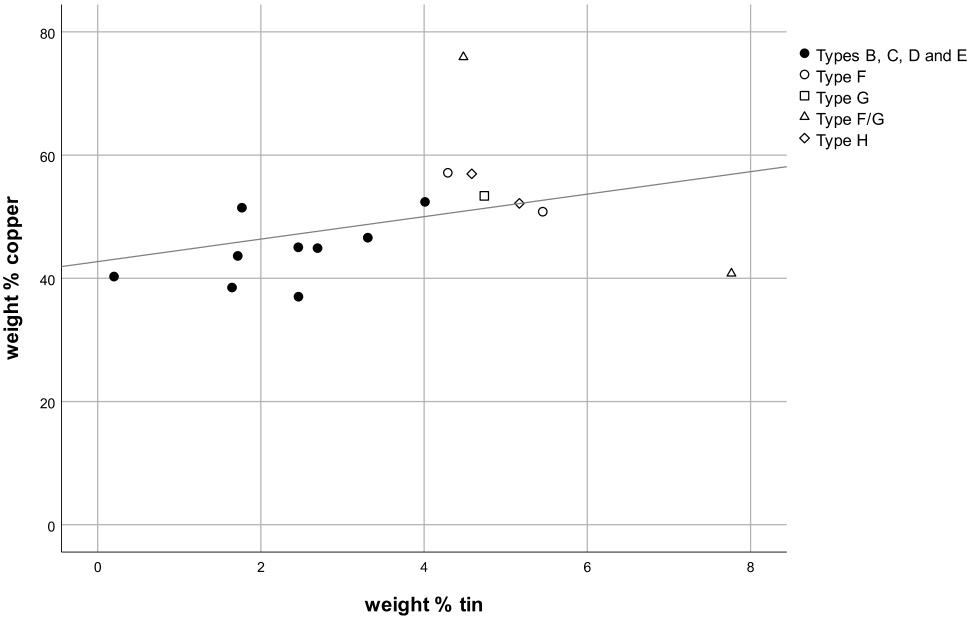

Figure A4.1 Norfolk Wolf-type coins: plot of tin against copper values

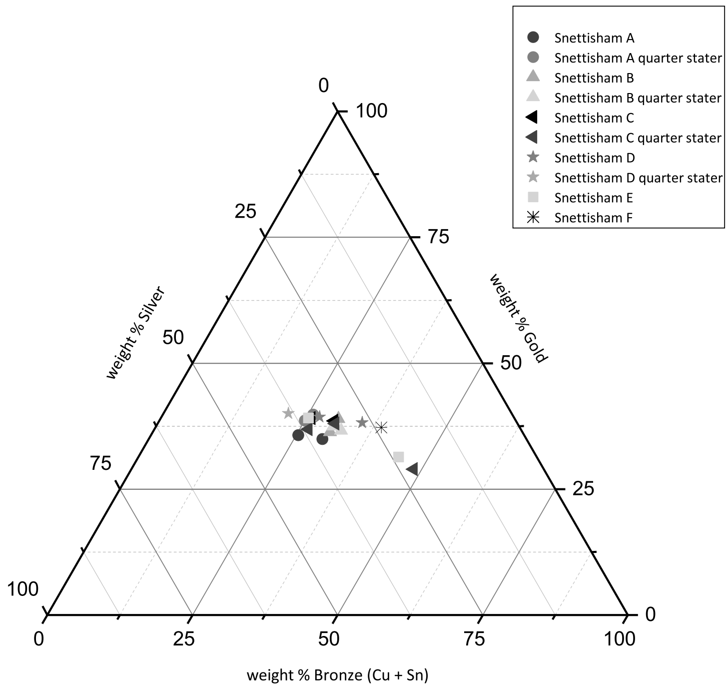

Figure A4.2 Snettisham-type staters and quarter staters by issue: ternary plot of gold, silver and copper/tin

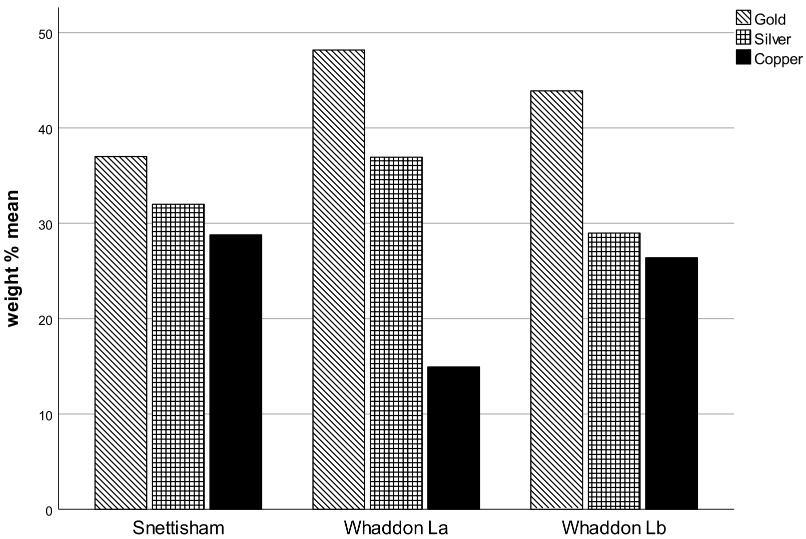

Figure A4.3 Comparison of the metal contents of Snettisham-type coins and British La and Lb types (the latter analysed by Cowell 1992)

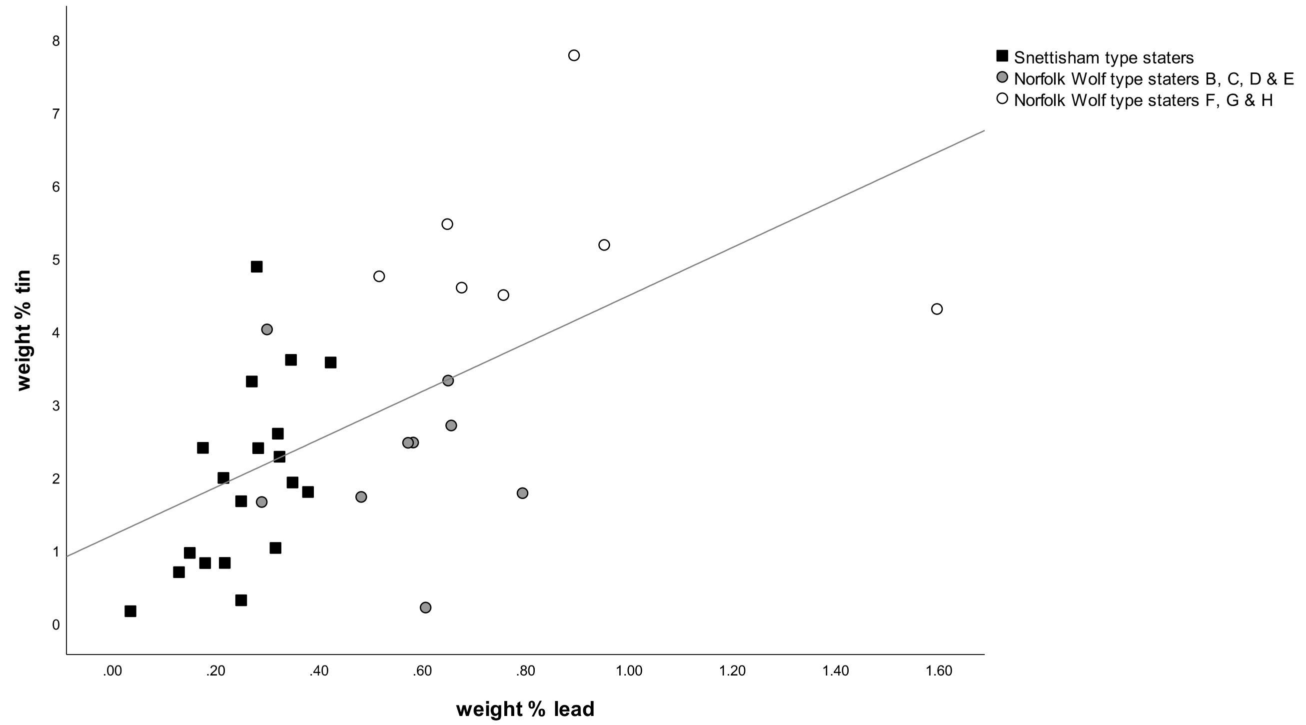

Figure A4.4 Plot of tin against lead values for the coins analysed in this report

associated with the tin rather than with the silver. This is unusual at such low levels, lead being an inevitable by-product of the cupellation process used to refine silver in antiquity. At these levels it seems reasonable to suggest that very little lead was coming from the silver, indicating a very efficient refining technology. The ratio of lead to tin is in the order of 1:5/1:7 for both the Snettisham and Norfolk Wolf types, and it is perhaps interesting to note that this is the same ratio found in the cast potin coins from the Snettisham area. Northover (1992, 247) suggests that a similar alloy to that of this base metal coinage was being used to produce the British Lb and Lc (*ABC* 2240) types and we may be seeing a similar phenomenon here.

Appendix 5
Analysis of Selected Gold and Silver Alloy Objects from Hoards A, B and C and Comparative Material

Peter Northover

In the tables that follow, the sample numbers have two components: 'Batch' (SHMA and SHMB), which groups the samples taken in a given museum visit, and 'No.', which is the number within a batch. NB: Arsenic (As) not analysed in Ag/Au-based alloys.

The Clarke (1954) hoard numbers and inventory numbers are both given, as well as the catalogue numbers from this volume. Due to the complexities of cross-referencing with Clarke's system (see Concordance, Appendix 3a), it has not always been possible to create a one-to-one concordance with the catalogue numbers used in this volume, and thus sometimes a range is given. Two samples were highly corroded; their compositions are given in italics with copper omitted.

Table A5.1 Analysis of gold and silver alloy objects from Snettisham Hoards A, B and C (See Chapter 18 for methods and Figs 18.1–3)

Cat. no.	Sample batch	Sample no.	Clarke cat. no.	Clarke inv. no.	Object type	Component tested	Sn	Sb	Pb	Co	Ni	Fe	Ag	Au	Zn	Bi	Cu
A.2	SHMB	22	Hd. A No. 2	TT2	Torc (tubular)	Torc terminal	0.00	0.00	0.02	0.00	0.00	0.05	12.62	83.01	0.00	0.00	4.30
A.3	SHMB	25	Hd. A No. 3	TT3	Torc (tubular)	Torc terminal	0.00	0.02	0 02	0.00	0.02	0.05	9.13	89.45	0.00	0.00	1.33
A.3	SHMB	23	Hd. A No. 3	TT3	Torc (tubular)	Sheet	0.00	0.00	0.00	0.01	0.01	0.07	12.43	83.00	0.00	0.00	4.49
?A.3	SHMA	7	Hd. A No. 3?	?TT3	Torc (tubular)	Sheet fragment	0.00	0.01	0.00	0.00	0.01	0.07	12.37	83.10	0.00	0.00	4.45
A.4	SHMB	A	Hd. A No. 4	TT4	Torc (tubular)	Gold band on core	0.00	0.00	0.02	0.01	0.01	0.09	6.74	88.76	0.00	0.00	4.38
A.4	SHMB	43	Hd. A No. 4	TT4	Torc (tubular)	Small section of tube	0.00	0.00	0.02	0.01	0.02	0.06	26.55	69.81	0.00	0.00	3.54
A.4	SHMB	42	Hd. A No. 4	TT4	Torc (tubular)	Large section of tube	0.00	0.01	0.01	0.01	0.01	0.05	25.97	69.18	0.00	0.00	4.76
A.5/A.6	SHMB	24	Hd. A No. 4	TT4	Torc (tubular)	Loose terminal	0.00	0.01	0.00	0.01	0.01	0.05	26.35	69.95	0.00	0.00	3.63
B.1a	SHMB	92	Hd. B No. 7	RL14	Ring (large)		0.00	0.00	0.04	0.005	0.01	0.02	52.25	15.22	0.01	0.00	32.45
B.1b	SHMA	27	Hd. B No. 6	RL13	Ring (large)		0.00	0.08	0.07	0.005	0.03	0.02	56.94	11.38	0.00	0.03	31.45
B.1c	SHMB	G	Hd. B No. 10	R1	Ring (small)		0.00	0.00	0.11	0.01	0.01	0.03	59.91	14.61	0.02	0.00	25.31
B.1e	SHMB	63	Hd. B No. 13	LT1	Torc/bracelet (multi-strand, loop terminal)		0.00	0.01	0.00	0.01	0.01	0.03	41.78	49.97	0.00	0.00	8.19
B.1f	SHMA	17	Hd. B No. 15	LT3	Torc/bracelet (multi-strand)		0.00	0.02	0.05	0.01	0.01	0.01	41.18	42.27	0.01	0.01	16.45
B.1g	SHMB	6	Hd. B No. 16	LT4	Torc/bracelet (multi-strand)		0.00	0.00	0.04	0.00	0.00	0.02	44.14	45.61	0.00	0.00	10.19
B.1h	SHMB	94	Hd. B No. 11	R14	Ring (small)		0.00	0.00	0.11	0.00	0.01	0.01	50.26	25.70	0.00	0.00	23.92
B.2	SHMB	10	Hd. B No. 14	LT2	Torc/bracelet (multi-strand)		0.00	0.01	0.02	0.01	0.01	0.12	34.39	52.83	0.01	0.00	12.61
B.3	SHMB	21	Hd. B No. 20	LT8	Torc/bracelet (multi-strand)		0.00	0.01	0.00	0.01	0.01	0.01	21.38	75.51	0.00	0.00	3.08
B.4	SHMB	2	Hd. B No. 19	LT7	Torc/bracelet (multi-strand)		0.00	0.01	0.06	0.01	0.01	0.02	44.20	39.84	0.00	0.00	15.86
B.5	SHMB	9	Hd. B No. 21	LT14	Torc/bracelet (multi-strand, loop terminal)		0.21	0.23	0.24	0.01	0.01	0.01	62.25	4.71	0.00	0.02	32.32
B.6	SHMB	90	Hd. B No. 22	LT15	Wire/?torc/?bracelet		2.68	0.16	0.18	0.01	0.03	0.02	37.77	10.46	0.00	0.00	48.70
B.7	SHMB	5	Hd. B No. 17	LT5	Torc/bracelet (multi-strand)		0.00	0.02	0.16	0.01	0.02	0.01	43.71	25.05	0.00	0.00	31.03
B.8	SHMA	21	Hd. B No. 18	LT6	Bracelet (multi-strand, loop terminal)		0.00	0.00	0.03	0.02	0.02	0.01	44.03	40.54	0.00	0.00	15.36
B.9	SHMB	L	Hd. B No. 24	LT20	Torc/bracelet (multi-strand, loop terminal)		4.92	0.03	0.17	0.02	0.05	0.13	11.39	1.85	0.01	0.00	81.43
B.20	SHMB	H	Hd. B No. 5	RL12	Ring (large)		0.00	0.12	0.05	0.01	0.06	0.01	60.12	0.27	0.01	0.16	39.19
B.24	SHMA	29	Hd. B No. 4	RL15	Ring (large)		0.22	0.03	0.07	0.01	0.03	0.01	29.79	6.24	0.00	0.01	63.61

Cat. no.	Sample batch	Sample no.	Clarke cat. no.	Clarke inv. no.	Object type	Component tested	Sn	Sb	Pb	Co	Ni	Fe	Ag	Au	Zn	Bi	Cu
B.24	SHMA	28	Hd. B No. 4	RL15	Ring (large)		0.23	0.04	0.1	0.01	0.01	0.00	29.30	6.01	0.01	0.00	64.31
B.25	SHMB	95	Hd. B No. 9	R11	Ring (small)		0.41	0.03	0.10	0.00	0.01	0.01	57.64	10.74	0.02	0.00	31.04
B.26	SHMA	32	Hd. B No. 2	MC2	Ingot		0.73	0.02	0.08	0.00	0.01	0.02	32.37	56.26	0.00	0.00	10.51
B.27	SHMB	61	Hd. B No. 1	MC1	Ingot		0.00	0.02	0.02	0.00	0.01	0.01	56.23	16.12	0.00	0.00	27.59
C.1–5, C.21	SHMB	18	Hd. C No. 16	LT12	Torc/bracelet (multi-strand)		0.37	0.04	0.19	0.01	0.01	0.05	62.28	18.33	0.01	0.00	18.72
C.1–5, C.21	SHMB	14	Hd. C No. 16	LT12	Torc/bracelet (multi-strand)		0.94	0.06	0.03	0.00	0.02	0.01	55.36	14.07	0.00	0.02	29.49
C.1–5, C.21	SHMB	O	Hd. C No. 16	LT12	Torc/bracelet (multi-strand)		0.51	0.03	0.23	0.01	0.01	0.01	50.09	12.33	0.00	0.00	36.79
C.6–12, C.15–6, C.18	SHMB	4	Hd. C No. 12	LT9	Rod/wire/?torc/?bracelet		0.00	0.00	0.00	0.01	0.01	0.01	49.95	33.14	0.01	0.00	16.88
C.6–12, C.15–6, C.18	SHMB	8	Hd. C No. 12	LT9	Rod/wire/?torc/?bracelet		0.00	0.00	0.14	0.01	0.02	0.02	49.34	30.73	0.00	0.00	19.74
C.6–12, C.15–6, C.18	SHMB	88	Hd. C No. 12	LT9	Rod/wire/?torc/?bracelet		0.00	0.00	0.14	0.02	0.02	0.02	49.34	30.73	0.00	0.00	19.73
C.6–12, C.15–6, C.18	SHMB	I	Hd. C No. 12	LT9	Rod/wire/?torc/?bracelet		0.00	0.01	0.08	0.01	0.01	0.01	51.40	22.25	0.03	0.00	26.24
C.6–12, C.15–6, C.18	SHMB	J	Hd. C No. 12	LT9	Rod/wire/?torc/?bracelet		0.00	0.01	0.07	0.00	0.01	0.01	51.54	20.31	0.00	0.00	28.06
C.6–12, C.15–6, C.18	SHMB	93	Hd. C No. 12	LT9	Rod/wire/?torc/?bracelet		0.00	0.02	0.07	0.01	0.02	0.01	48.35	20.03	0.00	0.00	31.50
C.6–12, C.15–6, C.18	SHMB	89	Hd. C No. 12	LT9	Rod/wire/?torc/?bracelet		0.03	0.02	0.03	0.01	0.01	0.01	44.26	17.79	0.01	0.00	37.83
C.6–12, C.15–6, C.18	SHMB	91	Hd. C No. 12	LT9	Rod/wire/?torc/?bracelet		0.00	0.01	0.08	0.01	0.02	0.01	46.68	17.14	0.01	0.00	36.04
C.6–12, C.15–6, C.18	SHMB	K	Hd. C No. 12	LT9	Rod/wire/?torc/?bracelet		0.00	0.04	0.08	0.01	0.01	0.02	47.27	14.64	0.01	0.00	37.93
C.13, C.19–20	SHMA	20b	Hd. C No. 14	LT11	Wire/?Torc/?bracelet (multi-strand, ?loop terminal)		0.00	0.03	0.00	0.01	0.02	0.01	35.04	39.85	0.00	0.00	25.04
C.13, C.19–20	SHMA	20a	Hd. C No. 14	LT11	Wire/?Torc/?bracelet (multi-strand, ?loop terminal)		0.00	0.02	0.08	0.01	0.01	0.01	40.77	35.47	0.00	0.00	23.64

Cat. no.	Sample batch	Sample no.	Clarke cat. no.	Clarke inv. no.	Object type	Component tested	Sn	Sb	Pb	Co	Ni	Fe	Ag	Au	Zn	Bi	Cu
C.13, C.19–20	SHMB	C	Hd. C No. 14	LT11	Wire/?Torc/?bracelet (multi-strand, ?loop terminal)		0.00	0.01	0.02	0.00	0.00	0.03	44.18	34.99	0.00	0.00	20.77
C.13, C.19–20	SHMB	87	Hd. C No. 14	LT11	Wire/?Torc/?bracelet (multi-strand, ?loop terminal)		0.01	0.02	0.02	0.00	0.01	0.01	41.72	32.27	0.00	0.00	25.94
C.13, C.19–20	SHMA	19	Hd. C No. 14	LT11	Wire/?Torc/?bracelet (multi-strand, ?loop terminal)		0.00	0.01	0.07	0.00	0.01	0.01	48.04	21.02	0.00	0.00	30.85
C.13, C.19–20	SHMB	88	Hd. C No. 14	LT11	Wire/?Torc/?bracelet (multi-strand, ?loop terminal)		0.00	0.01	0.14	0.00	0.02	0.01	45.90	12.01	0.01	0.00	41.90
C.14	SHMB	F	Hd. C No. 13	LT10	Wire/?torc/?bracelet		1.13	0.04	0.14	0.01	0.02	0.02	52.60	15.64	0.00	0.00	30.41
C.17	SHMB	S	Hd. C No. 15	MC5	Wire/?torc/?bracelet		0.00	0.11	0.02	0.00	0.01	0.02	61.47	29.75	0.00	0.00	8.62
C.17	SHMB	8	Hd. C No. 15	MC5	Wire/?torc/?bracelet		0.00	0.02	0.16	0.01	0.02	0.01	43.71	25.05	0.00	0.00	31.03
C.45	SHMA	31	Hd. C No. 2	MC4	Ring (large)		1.57	0.10	0.23	0.01	0.02	0.02	41.11	8.04	0.00	0.01	48.90
C.46	SHMB	77	Hd. C No. 3	RL1	Ring (large)		6.57	0.15	0.75	0.02	0.11	0.18	3.67	0.81	0.02	0.03	94.26
C.47	SHMB	B	Hd. C No. 6	R15	Ring (small)		0.00	0.00	0.03	0.00	0.01	0.06	22.55	64.57	0.00	0.00	12.78
C.50	SHMB	46	Hd. C No. 11	MC3	Sheet		0.00	0.00	0.02	0.01	0.01	0.02	38.95	58.73	0.00	0.00	2.27
B/C.1	SHMA	23	Hd. B/C No. 26	LT16	Torc/bracelet (multi-strand, loop terminal)		0.55	0.07	0.08	0.01	0.02	0.01	49.18	10.12	0.01	0.00	39.96
B/C.2	SHMA	24	Hd. B/C No. 28	LT18	Torc/bracelet (multi-strand, loop terminal)		1.21	0.04	0.25	0.00	0.01	0.01	81.27	1.78	0.02	0.06	15.36
B/C.3–4	SHMA	30	Hd. B/C No. 53	LT47	Torc/bracelet (multi-strand)		9.34	0.20	0.07	0.30	0.01	0.01	0.22	18.41	3.53	0.00	
B/C.3–4	SHMB	56	Hd. B/C No. 53	LT47	Torc/bracelet (multi-strand)		6.46	0.17	0.04	0.20	0.01	0.01	0.03	13.01	2.23	0.00	
B/C.5	SHMB	36	Hd. B/C No. 50	LT44	Torc/bracelet (multi-strand, loop terminal)		0.00	0.03	0.05	0.01	0.01	0.01	45.22	25.40	0.00	0.00	29.27
B/C.6	SHMA	18	Hd. B/C No. 27	LT17	Wire/torc/bracelet (multi-strand, ?loop terminal)		2.06	0.03	0.27	0.01	0.03	0.03	37.32	5.02	0.00	0.01	55.23
B/C.6	SHMB	59	Hd. B/C No. 27	LT17	Wire/torc/bracelet (multi-strand, ?loop terminal)		1.60	0.04	0.23	0.01	0.02	0.03	28.41	3.26	0.00	0.01	66.39
B/C.7–8	SHMB	T	Hd. B/C No. 42	LT36	Torc/bracelet (multi-strand, loop terminal)		6.90	0.02	0.07	0.02	0.01	0.06	9.31	1.80	0.01	0.00	81.81
B/C.64	SHMB	Q	Hd. B/C No. 10	R4	Ring (small)		5.41	0.04	0.21	0.04	0.03	0.01	10.15	1.81	0.01	0.00	78.97
B/C.84	SHMB	60	Hd. B/C No. 19	MC7	Ingot		0.00	0.01	0.02	0.00	0.01	0.01	46.54	20.94	0.01	0.00	32.47
B/C.85	SHMB	62	Hd. B/C No. 18	MC6	Ingot		0.00	0.03	0.10	0.01	0.02	0.02	48.64	14.64	0.01	0.00	36.54

Cat. no.	Sample batch	Sample no.	Clarke cat. no.	Clarke inv. no.	Object type	Component tested	Sn	Sb	Pb	Co	Ni	Fe	Ag	Au	Zn	Bi	Cu
B/C.86	SHMA	33	Hd. B/C No. 20	MC8	Ingot		2.24	0.11	0.08	0.01	0.09	0.11	27.87	8.41	0.01	0.00	61.08
B/C.87	SHMA	34	Hd. B/C No. 21	MC9	Lump		0.00	0.01	0.01	0.00	0.01	0.01	38.25	40.08	0.00	0.00	21.65
S.16	SHMB	E	N/A	N/A	Torc (multi-strand, ring terminal)		0.76	0.00	0.52	0.06	0.02	0.01	63.69	14.21	0.00	0.00	20.73
S.17	SHMB	86	N/A	N/A	Torc (multi-strand, ring terminal)		2.26	0.07	0.16	0.01	0.04	0.04	30.46	23.05	0.00	0.00	43.91
S.17	SHMB	85	N/A	N/A	Torc (multi-strand, ring terminal)		2.10	0.04	0.13	0.00	0.03	0.01	24.47	20.22	0.00	0.00	53.00
S.18	SHMB	17	N/A	N/A	Torc (multi-strand, loop terminal)		1.07	0.02	0.59	0.01	0.00.	0.02	55.74	0.14	0.01	0.09	42.32
S.31	SHMA	16	N/A	N/A	Torc (multi-strand, loop terminal)		0.00	0.02	0.02	0.01	0.01	0.01	46.92	27.90	0.00	0.01	25.11

Table A5.2 Analysis of comparative gold/silver alloy torcs from other sites

Site	Sample batch	Sample no.	Object type	Component tested	Sn	Sb	Pb	Co	Ni	Fe	Ag	Au	Zn	Bi	Cu
Bawsey, Norfolk, UK (NCM reg. no. 1942.126)	SHME	3	Torc (multi-strand, loop terminal)		0	0	0	0.01	0	0.01	50.78	38.32	0	0	10.88
Bawsey, Norfolk, UK (NCM reg. no. 1944.106)	SHMC	3	Torc (multi-strand, loop terminal)		0.01	0.01	0.09	0.01	0.01	0.02	47.04	21.87	0.01	0	30.93
Hengistbury Head, Dorset, UK	HH	A	Bracelet (multi-strand, loop terminal)	wire	0	0.01	0.01	0.01	0.01	0.01	18.92	78.42	0	0	2.64
Hengistbury Head, Dorset, UK	HH	B	Torc (multi-strand, buffer terminal)	wire	0	0	0	0.01	0.01	0.01	46.31	44.32	0	0	9.38
Mailly-le-Camp, France	MAN	23	Torc (tubular)	tube	0	0	0.04	0.01	0	0.08	4.25	93.92	0	0	1.71
Netherurd, Tweeddale, UK (National Museums Scotland)	SHME	4	Torc (torus terminal)	terminal	0	0.01	0	0.01	0	0.03	25.21	70.03	0	0	4.72
North Creake, Norfolk, UK (NCM reg. no. 1949.97)	SHMC	1	Torc (torus terminal)	terminal, interior	1.85	0.02	0.18	0	0.02	0.04	31.76	14.17	0	0	51.96
North Creake, Norfolk, UK (NCM reg. no. 1949.97)	SHMC	2	Torc (torus terminal)	terminal, exterior	0.17	0.02	0.08	0.01	0.01	0.02	43.95	19.32	0.01	0	36.42
Ulceby, Lincolnshire, UK (Ashmolean Museum Reg. No. 1927.6659)	SHMR	2	Torc (multi-strand, loop terminal)		0	0	0	0.01	0.01	0.01	41.77	30.37	0	0	27.84
Ulceby, Lincolnshire, UK (Ashmolean Museum Reg. No. 1927.6660)	SHME	1	Torc (multi-strand, loop terminal)		0	0.01	0.07	0	0.01	0.04	49.48	28.95	0.01	0	21.44

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Michael de Bootman has been interested in Roman pottery since finding a Roman kiln site on his father's farm at Pentney, Norfolk aged 8. On leaving school, he worked on the Raunds project in Northamptonshire fieldwalking and then joined the army before setting up a specialist book selling and publishing company in the late 1990s. Working with Alice Lyons, he is currently involved in bringing to publication a corpus of the Nar Valley Roman pottery industry.

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John Fenn is a silver/goldsmith specialising in little used hand-working methods, for example deep surface embossing, and hammer graving that allows duplication of the cross-hatching of many British Iron Age bronze mirrors. Techniques of lap grinding and polishing bronze demonstrate the remarkable clarity and reflectivity of British mirrors. Experience with these processes and materials has made the authenticity of finds of particular interest, as well as highlighting problems of manufacture and function that are not always certain, for example demonstrating economical production of Snettisham torc wire.

Eleanor Ghey is a curator in the Department of Money and Medals at the British Museum with responsibility for coin hoards reported as potential Treasure under the Treasure Act 1996. This role includes reporting and advising on new discoveries and she has researched and published Iron Age and Roman hoards and site assemblages from the British Isles. Her previous publications include *Hoards: Hidden History* (2015) and has recently edited *Recent Discoveries of Tetrarchic Hoards from Roman Britain and their Wider Context* (2024).

Marilyn Hockey joined the British Museum's Department of Conservation in 1976 and worked on the conservation of historical and archaeological metalwork of all periods. In the course of her career she developed a particular specialism in the investigative re-shaping and repair of precious metals. She retired in 2015, having served for ten years as Head of the Ceramics, Glass and Metals Section.

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Duncan Hook is a research scientist specialising in the examination and analysis of museum and archaeological artefacts. He has applied analytical techniques such as X-ray fluorescence, atomic absorption spectrophotometry and ICP-AES to a wide range of materials, but especially to gold, silver and copper alloys, dating from the inception of metallurgy to the present day. These studies have enabled objects to be characterised accurately for purposes such as authenticity issues and aspects of conservation. He is a Visiting Academic in the Department of Scientific Research at the British Museum.

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Peter Northover read Metallurgy at Oxford where he also completed a DPhil. Since then he has been pursuing the characterisation of non-ferrous and precious metals in archaeology up to and beyond the Industrial Revolution. Particular projects include developing a quantitative approach to metallography for correlation with compositional analysis, with projects ranging from the metallography of fire-damaged bronze and silver to the metallurgy of early railways. In retirement he is pursuing a PhD in landscape archaeology at the University of Exeter.

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Sarah Percival is a highly experienced prehistoric pottery specialist working on Neolithic, Bronze Age and Iron Age assemblages from across East Anglia and the East Midlands. She first studied archaeology and prehistory as an undergraduate at Sheffield University (1986–9), before undertaking a 'Ceramics and Lithics' master's degree at Southampton University (2004–5), and has worked at Norfolk Archaeological Unit, Oxford Archaeology East and Cambridge Archaeology Unit, though she is primarily a freelance specialist. She is the incoming Chair of the PCRG.

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